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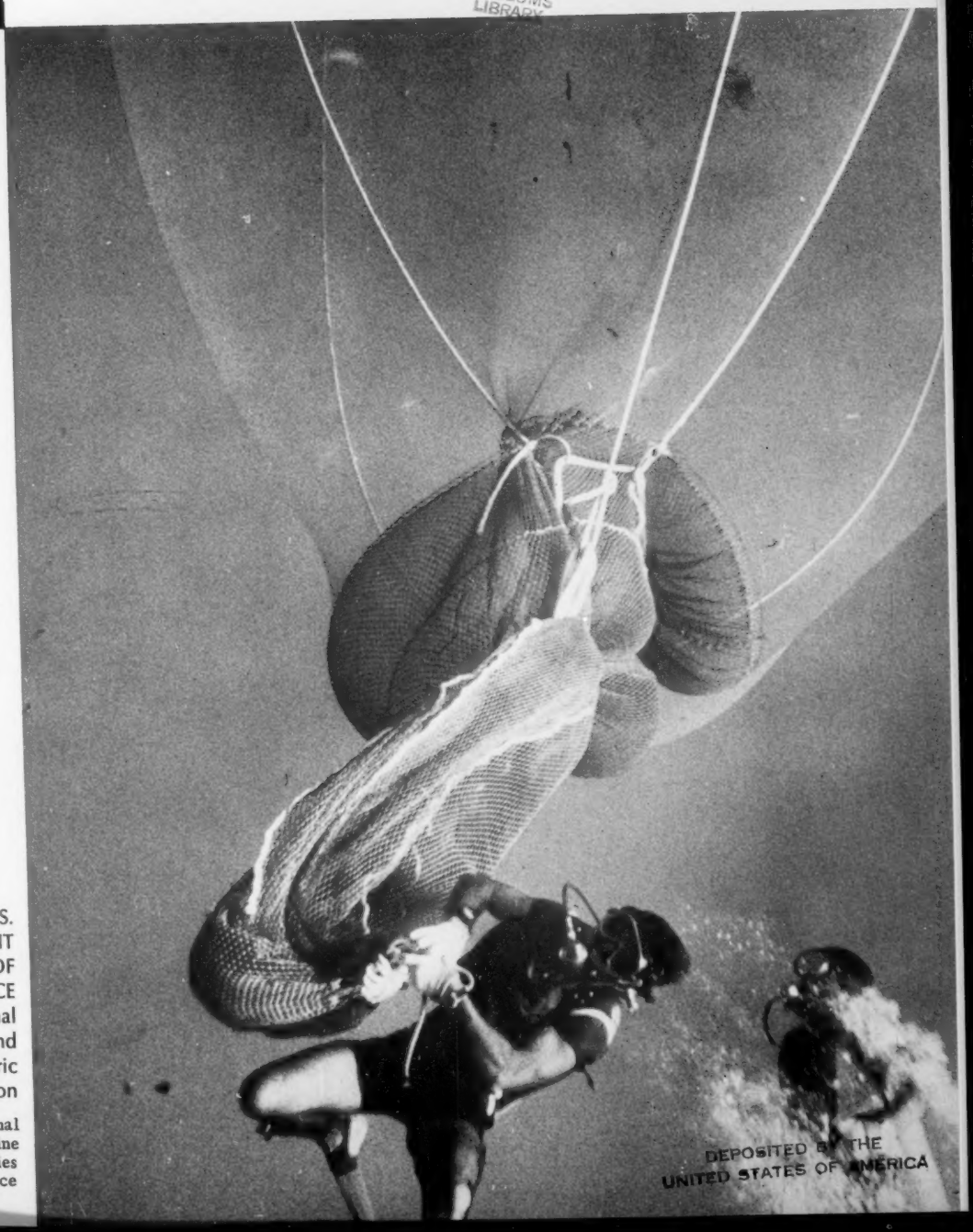

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

National Marine Fisheries Service

U.S. DEPARTMENT OF COMMERCE
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Marine Fisheries Service
Philip M. Roedel, Director

COVER: Looking at it from cod end, John Naughton and Robert Moncrief, NMFS scientists-divers, discover that a Cobb pelagic trawl used to sample juvenile tuna is distorted by a faulty lazyline. (Photo: NMFS Hawaii)

For insight into the value of research beneath the surface, see article by William L. High on page 1.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the National Marine Fisheries Service.

Fishermen's Memorial
Gloucester, Mass.

Editor: Edward Edelsberg

Production Manager: Alma Greene

Throughout this book, the initials NMFS stand for the National Marine Fisheries Service, part of National Oceanic and Atmospheric Administration (NOAA), U.S. DEPARTMENT OF COMMERCE.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-9066.

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CONTENTS

	Page
ARTICLES	
Underwater Fishery Studies Are Valuable, by William L. High	1
Seasonal and Geographic Characteristics of Fishery Resources: California Current Region--VII. Pacific Sardine, by David Kramer and Paul E. Smith	7
Pond-Raised Channel Catfish: The Design of Boom-Mounted Brailers to Move Them, by Donald C. Greenland, Earnest T. Carlton, Robert L. Gill, and Sammie L. Weaver	13
UNITED STATES	
Events and Trends	19
INTERNATIONAL	26
Asia	27
Europe	31
Latin America	39
BOOKS	40
INDEX	52

NMFS Safety Board Reviews Scuba Diving Operations: NMFS Regional Diving Officers and Diving Coordinator William L. High (wearing sunglasses) met in Boston, Mass., to pinpoint unsafe procedures and to document successful uses of diving as a research tool.

Left to right: Clifford Newell, Boothbay Harbor, Maine; Ray Shuey, La Jolla, Calif.; Ian Ellis, Seattle, Wash.; Mike Russell, Pascagoula, Miss.; John Naughton, Honolulu, Hawaii; High, Seattle; Richard Cooper, Boothbay Harbor; Louis Barr, Auke Bay, Alaska.

(Photo: Gareth W. Coffin)

UNDERWATER FISHERY STUDIES ARE VALUABLE

William L. High

Scuba-diving scientists and technicians are making valuable contributions to man's understanding of the ocean and its creatures. Divers frequently conduct underwater research in minutes or hours which would take surface-restricted scientists with elaborate support vessels and equipment many days or months to accomplish. Although scuba is only one of many available professional tools, nearly 100 National Marine Fisheries Service (NMFS) scientists don underwater breathing apparatus from time to time to directly observe and study the ecosystem and the behavior of marine organisms to it.

Diving teams are very mobile, thereby increasing their capabilities and effectiveness. Occasionally, tasks assigned to some large research vessels can be carried out more quickly and less expensively by divers operating from a skiff. In Alaska, diving scientists employ many methods for reaching their dive sites. Large commercial jets carry the biologists on the 3,600-mile trip from home base at Auke Bay to Amchitka Island, where they are monitoring the marine environment (Figure 1) for effects of nuclear testing. On more modest trips, they may travel to the dive site by research vessel, skiff, snow-track vehicle, helicopter, or floatplane. Occasionally a floatplane may be used for both transportation and as a diving platform. Two divers and a pilot fly to a remote location, carry out their underwater work, and return home in a fraction of the time needed to operate from a boat.

DIRECT OBSERVATIONS

In many studies, diving gear has eliminated a portion of the surface-bound scientist's blind spot. With scuba he can go "where the action is." NMFS divers in Seattle were invaluable during development of a hydraulic clam dredge. In spite of several dredge modifications, the water supply hose broke repeatedly without apparent cause. Yet, in less than two minutes, a diving team of gear experts observed that the nylon dredge tow rope stretched until the strain was picked up by the supply hose. After shortening the rope several feet, hose breakage ceased. Simple solution? Yes, once you have the needed information.

Later, the dredge failed to take clams when all engineering factors indicated it

Fig. 1 - Diver-biologists Lou Barr, Bill Heard, and Dave Hoopes, NMFS Laboratory, Auke Bay, Alaska, count and collect urchins at Amchitka Island as part of a bioenvironmental study to evaluate effects of nuclear testing. (NMFS Alaska: J. Helle)

The author, a fishery biologist and aquanaut, is with NMFS Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. E., Seattle, Washington 98102.

COMMERCIAL FISHERIES REVIEW
Reprint No. 921

should. Diving scientists were again asked to observe the dredge and see if the digging blade penetrated into the seabed deeply enough to encounter clams. A single 20-minute dive confirmed the dredge worked as designed--but there were no clams. Weeks of vessel time were saved.

Lobster life-history studies are an important aspect of research at the NMFS Boothbay Harbor Laboratory in Maine. Here the diver-scientist is defining the population ecology and dynamics of the "inshore" lobster, migratory behavior, population density, etc. (Figure 2). Habitat requirements and estimates of population structure are more precisely measured through direct observation and sampling--as opposed to indirect sampling from the surface using devices known to be selective.

The geoduck, a very large clam found along some Pacific Northwest shores at low tied, were thought to be few and far between until divers discovered large numbers in deep water. Surveys conducted by biologists diving for the Washington State Department of Fisheries and NMFS showed that great numbers of these delicious clams were available down to 100 ft. Because of diver-aided studies we now know most geoducks are inaccessible to shoreside clam diggers. A diver-operated commercial fishery now exists for geoducks.

Fig. 2 - Large lobsters, like this 25-lb. one captured by Jack Swindler, and very small juveniles, which are not readily captured by conventional traps, are brought up by divers for tagging and growth studies. (Richard Cooper)

GEAR DEVELOPMENT

Major strides were made in trawl development because diving-gear specialists observed experimental trawls in operation (Figure 3). The giant Cobb pelagic trawls and, more recently, the NMFS shrimp-sorting trawl developed by the Exploratory Fishing and Gear Research Base in Seattle, owe much of their success to diver evaluations (Figure 4). When nets are fished in relatively shallow water, divers can follow the towing warp to the otterboard, then swim along the groundlines to the trawl. Areas of slack web or excessive strain are immediately recognized. Biologists easily observe fish escape efforts (Figure 5). Vertical and horizontal openings of the trawl net are readily measured.

Several times, divers have discovered trawl defects made during manufacture which severely reduced the trawl's fishing capability (Figure 6). Occasionally, divers find nets used by both research and commercial vessels that have been hooked up incorrectly--causing trawl wings to cross or roll up. One fisherman asked the Seattle NMFS gear-diving team to observe his commercial trawl. The divers discovered the footrope passed about 10 inches above the ocean floor. Up to 50% of the potential catch was seen escaping beneath the net. Unfortunately, the fisherman had used the net for several months before the deficiency was discovered.

Divers assigned to the Pascagoula, Mississippi, Laboratory installed floating and submerged artificial structures in offshore locations to attract fish as part of a preliminary study to develop an NMFS-proposed automated fishing platform. Divers' estimates of fish school populations at structure sites were compared immediately after each dive with catches made by a purse seiner (Figure 7). Divers' estimates were found to be accurate enough to be used when the use of a commercial purse seiner was not feasible.

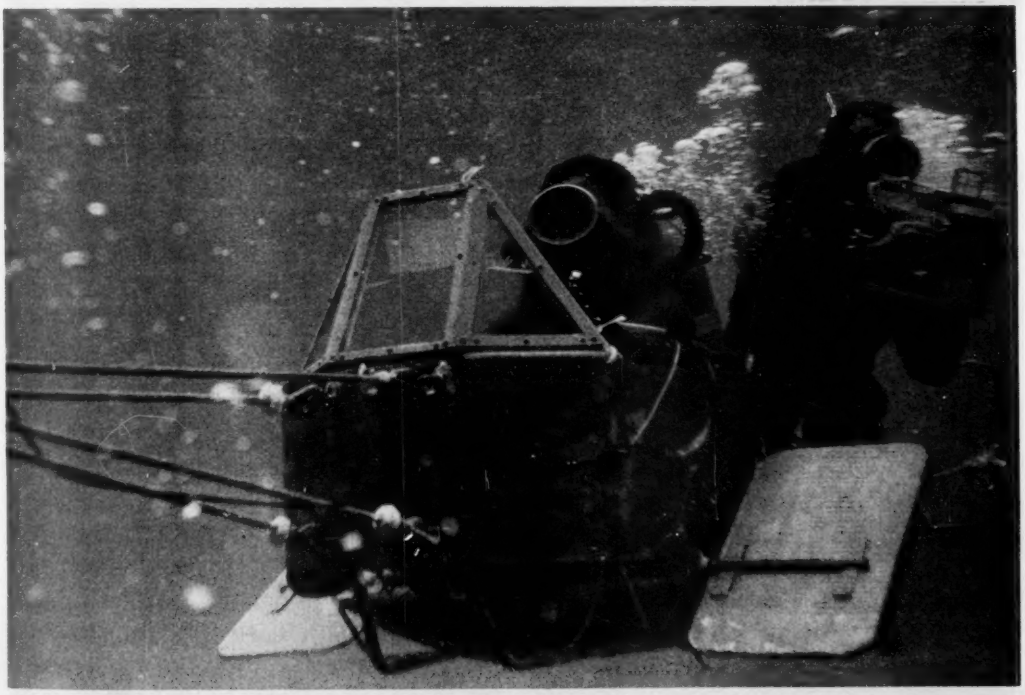

Fig. 3 - A sea sled piloted by Randolph Chang is towed alongside a midwater trawl to serve as a photographic platform for cameraman Reginald Gooding. Movies afford surface-restricted fishermen and biologists a fish-eye view of capturing gear. (NMFS Hawaii)

Fig. 4 - A nearly invisible, giant midwater trawl appears to engulf Hawaii area scientist John Naughton, who has discovered a small hole. Special training and safety requirements are imposed to protect scientist-divers working directly on a moving trawl. (NMFS Hawaii)

Fig. 5 - Scientists Larry D. Lusz and Ian E. Ellis hang onto headrope of a commercial bottom trawl to visually assess trawl's performance and to observe behavior of fish near the net. (William L. High)

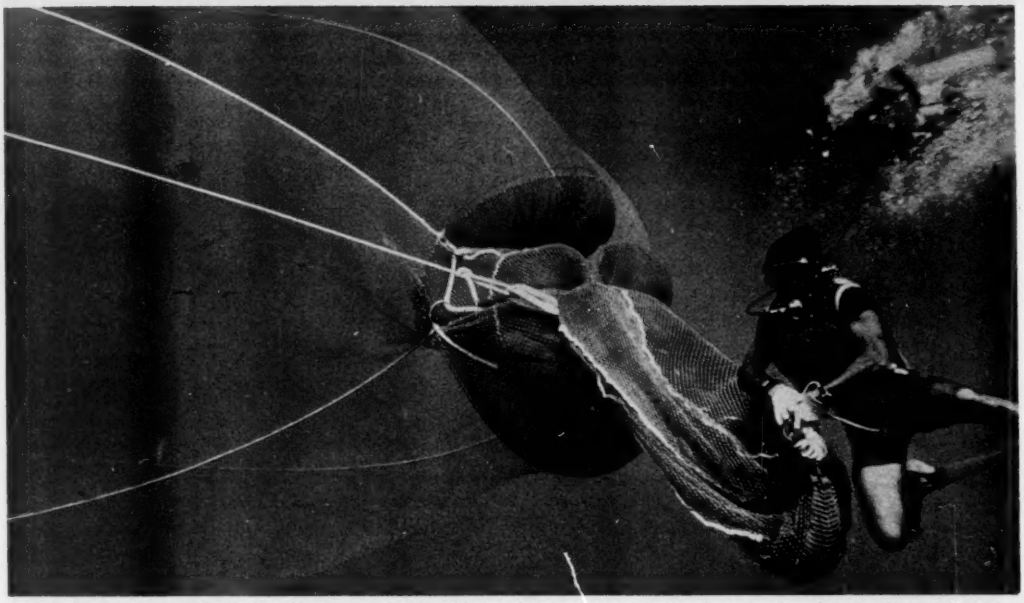

Fig. 6 - As seen from cod end, John Naughton and Robert Moncrief discover that a Cobb pelagic trawl used to sample juvenile tuna is distorted by a faulty lazyline. Sampling and commercial-gear deficiencies such as this, which are difficult to detect from the vessel, can be observed and often corrected by divers in a few minutes.

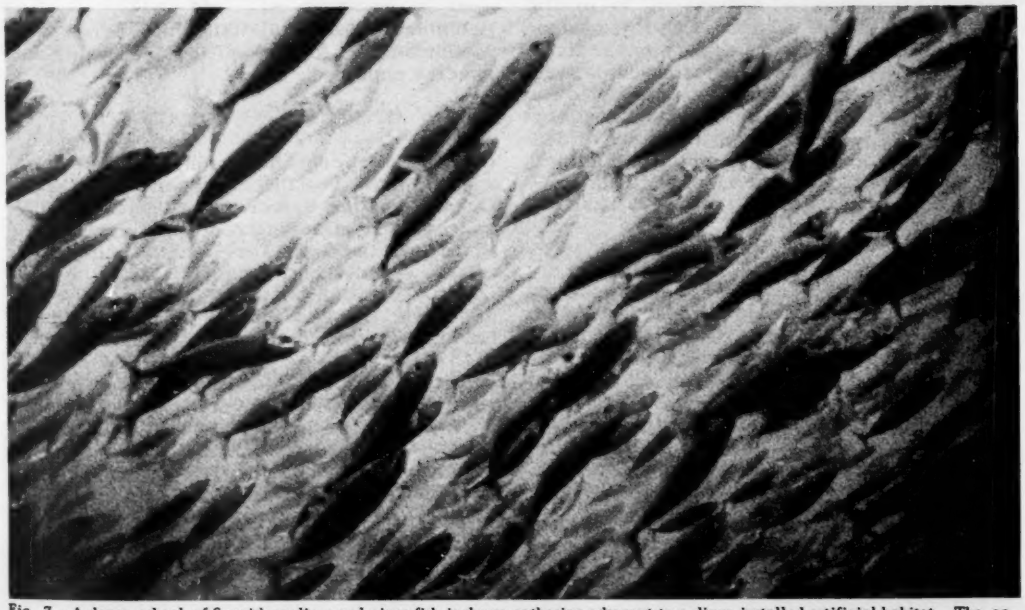

Fig. 7 - A dense school of Spanish sardines and cigar fish is shown gathering adjacent to a diver-installed artificial habitat. The aggregating characteristics of several structures were evaluated by biologist-divers near Panama City, Florida. (NMFS)

Fig. 8 - Aquanaut fishery biologists William L. High and Alan J. Beardsley position a fish trap for behavior experiments during Tektite II. They lived for two weeks on the ocean floor.

Observations of a midwater trawl by Pascagoula NMFS divers during actual fishing operations revealed that coastal pelagic school fish were swimming along with the net, entering and leaving the mouth of the net at will. These observations provided background information on fish-gear interaction required for the development of a proposed electrical trawl.

SATURATION DIVING

NMFS biologists participating in the Tektite II undersea program were able to conduct studies 25 to 80 ft below the ocean surface for up to 8 hours per day. Spiny lobsters habits, including feeding, nocturnal movements, and social relationships were investigated intensively because divers could readily observe the animals both day and night. Fish were observed in and around experimental and local fish traps (Figure 8). Methods were found to alter catch rates and species captured.

OTHER DIVING PROGRAMS

Research programs which have used diving as a research tool include recapturing tagged fish; assessing demersal and bait fish resources, and assessing pearl shell resources throughout the Trust Territories; determining effects of polluting, channel blasting, dredging, and log dumping; and observing shrimp densities, natural animal behavior, and behavior influenced by capturing gear.

More sophisticated diving systems currently under development by industry will soon extend the depth and work capability of all diving scientists and technicians. By direct observation they will better understand how to assist in environmental protection and to manage commercial and sport fisheries.

SEASONAL AND GEOGRAPHIC CHARACTERISTICS OF FISHERY RESOURCES

California Current Region--VII. Pacific Sardine

David Kramer and Paul E. Smith

The fishery for the Pacific sardine, Sardinops caeruleus, was, during the 1930s and early 1940s, the largest in the western hemisphere; it produced nearly 25% of all fish caught in the United States.

Research on this resource had been going on for about 25 years, when its decline in the 1940s triggered the most intensive fishery study ever mounted in the world--the California Cooperative Oceanic Fisheries Investigations (CalCOFI). During the decade 1951-60, surveys were carried out each year almost on a monthly basis. Their data have been used as a base for analysis of the sardine and other pelagic resources in the California Current region. For this series of reports, the data have been used to summarize trends in densities of spawning populations by season and geography off the coasts of California and Baja California (Kramer and Smith, 1970a, b, c, d, 1971a, b). The agencies of the CalCOFI, their area of survey, and the methods of treating the data were described in our first report.

One reason given for the decline of the sardine was the intensive fishing pressure brought on by the profitable reduction of whole fish to meal and oil; from 1936 through 1945, tonnage for reduction exceeded tonnage for canning. Landings reached a high of 791,000 tons in the 1936-37 season and, from 1937-38 through 1944-45, fluctuated from 493,000 to 680,000 tons. The northern fishery off Canada, Washington, and Oregon was one of pressure on older fish that migrated from the subpopulations off California. The northern fishery collapsed as intensive fishing off California reduced the age structures of the sardine populations on that coast. In a population biology study of this species, Murphy said in 1966 that the pre-1949 population had a maximum sustainable yield of 471,000 tons at a spawning population of 1 million tons.

As reported by the California Department of Fish and Game (Frey, 1971), sardine numbers in the variable environment of the California Current region were dependent on an age structure which contained seven or eight significant reproductive classes. The intensive fishery lowered sardine life expectancy so that the population began to approach single-class reproduction. Thus, with its inherent resiliency stripped away, the northern subpopulation (off central California) collapsed following two highly unsuccessful spawnings in 1949 and 1950.

In our report on the northern anchovy (Kramer and Smith, 1971a), we discussed briefly two other possible reasons for the failure of the sardine to recover its former abundance. One was the taking over of the sardine's ecological niche by the anchovy; the other was the possibility of natural fluctuation wherein the two species may have been independent of one another in different periods over the last 2,000 years (Soutar, 1967; Soutar and Isaacs, 1969).

Seasonal and Geographic Distributions

At one time the sardine ranged from southern Alaska to the Gulf of California. Tagging studies (Clark, 1945) conducted by Canada and the States of Washington, Oregón, and California (California also tagged sardines off central Baja California) indicated that the fish moved from every region to all of the others. Returns from those tagged on Baja California showed migration northward only as far as southern and central California.

The authors are Fishery Biologists, NMFS Southwest Fisheries Center, 8604 La Jolla Shores Drive, P.O. Box 271, La Jolla, California 92037.

COMMERCIAL FISHERIES REVIEW
Reprint No. 922

Attempts to differentiate subpopulations have been made on the basis of 1) differences in vertebral counts (Clark, 1947; McHugh, 1950)--indicating heterogeneity but not necessarily significant differentiation; 2) differences in temporal and areal spawning (Ahlstrom, 1960)--indicating fairly distinct subpopulations, "northern" off California and northern Baja California, "southern" off central Baja California, and "gulf" in the Gulf of California. (These differences can be seen in a 1970 atlas by Kramer which depicts the relative abundance of sardine eggs and larvae collected on every survey by the CalCOFI from 1951 through 1966); and 3) differences in blood systems (Sprague and Vrooman, 1962; Vrooman, 1964) which substantiated those subpopulations of Ahlstrom's analyses. The serological studies further demonstrated the movements evidenced by the tagging studies. These showed northern and southern subpopulations moving northward in spring and summer, and south in fall and winter.

Summarized data for 1951-60, used to predict the times and locations of adult sardine spawning, are shown in Figures 1 and 2. The relative distributions of all eggs and larvae collected by the CalCOFI for all cruises from 1951 through 1966 were depicted in an atlas by Kramer (1970). As for the anchovy (Kramer and Smith, 1971a), the summarized data on eggs and larvae are used to depict the occurrences for January through July and for October. The distributions for 5-mm larvae only are used because they are most abundant in plankton hauls.

Eggs and larvae show only slight differences in extent of their distributions in each of the same months for which they are illustrated. The lack of similarly shaded areas, for larvae as for eggs, 20% or more occurrences in plankton hauls, is attributed to the escapement, not absence, of small larvae through the meshes of the standard 1-m CalCOFI net (personal communication, William H. Lenarz, NMFS, La Jolla, California). The major centers of spawning (shaded areas) are evident first in January in small areas off central Baja California and southern California. These are the northern and southern subpopulations described above. With the passage of time, the southern group spreads northward and seaward; then, in May and June, it intermixes with the northern group, which spreads somewhat southward. In July, the two groups are separate again and, in October, heavy spawning occurs only off central Baja California. This is the off-season spawning group described by Ahlstrom (1960, p. 420), which he defined as the southern subpopulation.

The Fishery

The California Department of Fish and Game, in its report on the State's living marine resources (Frey, 1971), concluded its history of the sardine fishery: "Prior to 1967, management of the sardine resource in California almost entirely was limited to (1) control of tonnage of whole fish used for reduction, (2) case pack requirements (set number of cases of canned fish per ton of whole fish), and (3) restriction of the fishing season to the time of year when fish were most available and in prime condition for processing. A moratorium on sardine fishing in California was in effect during the 1967-68 and 1968-69 seasons. The moratorium limited the quantity of sardines which could be taken incidentally with other fish to 15% by weight of a mixed load. California landings for the 1967-68 season were 71 tons, while 52 tons were landed during the 1968-69 season.

"An extremely lucrative bait market for sardines has developed in the San Francisco Bay area in recent years. Sardines landed in California for this market bring the fishermen $400 to $500 per ton. During 1968, there were 323 tons of sardines imported from Mexico for use as bait. A bill (AB 564) enacted by the California Legislature in 1968 permitted the taking of 250 tons annually for bait. At present, the San Francisco-Delta bait market appears to be the most significant economic factor responsible for continued fishing mortality of the California sardine resource."

In its final discussion on the pelagic wetfish (packed in a "wet" condition, then cooked--hence wetfish), the Department stated:

"Landings of pelagic wetfish have been sizable in the past but have declined in more recent years. This decline is due to several factors: (1) the decline of sardine and Pacific mackerel stocks; (2) prohibiting the fishing industry from harvesting abundant anchovy stocks at a level indicated reasonable by scientific evidence; and (3) failure of the fishing industry to harvest greater

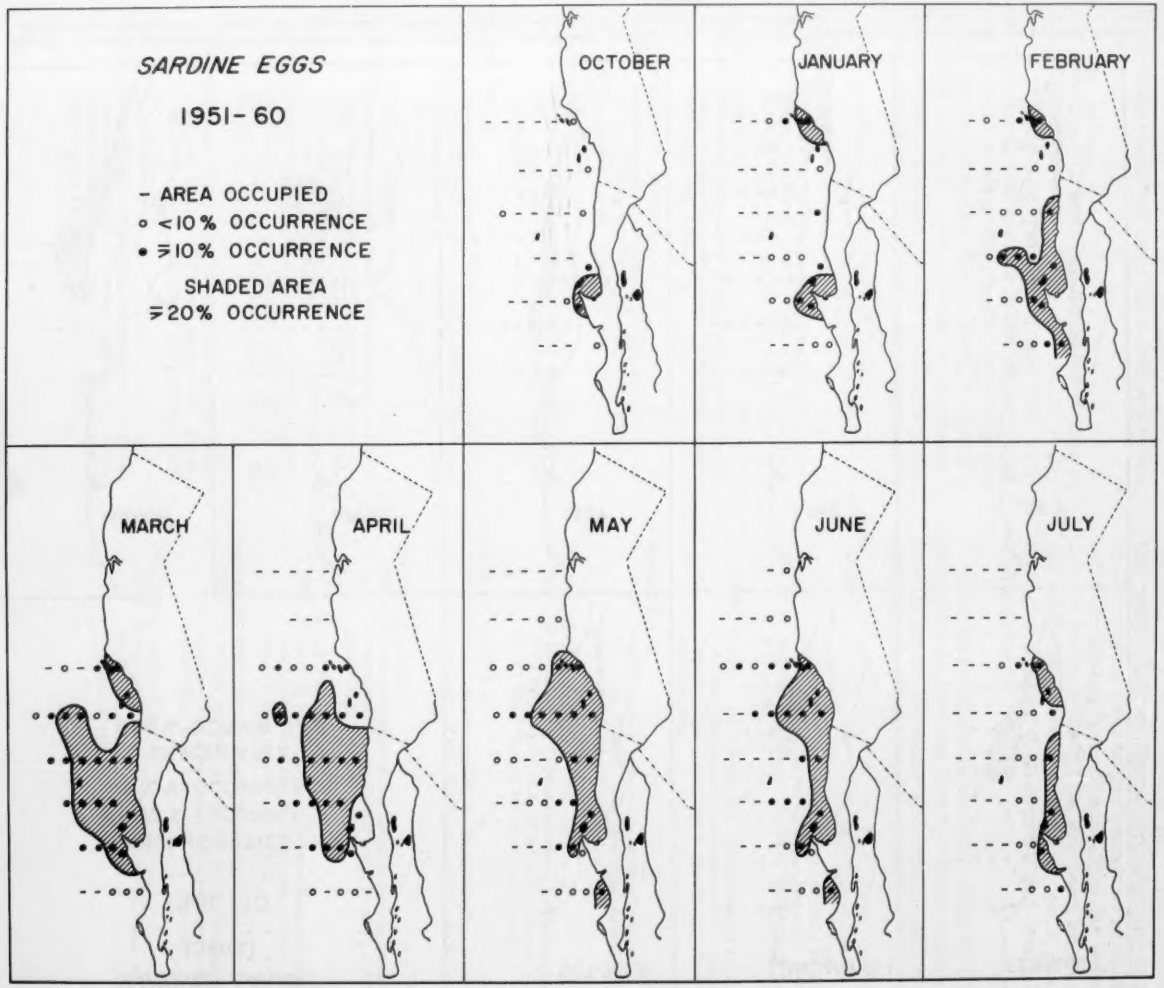

Fig. 1 - Percent occurrence of sardine eggs in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

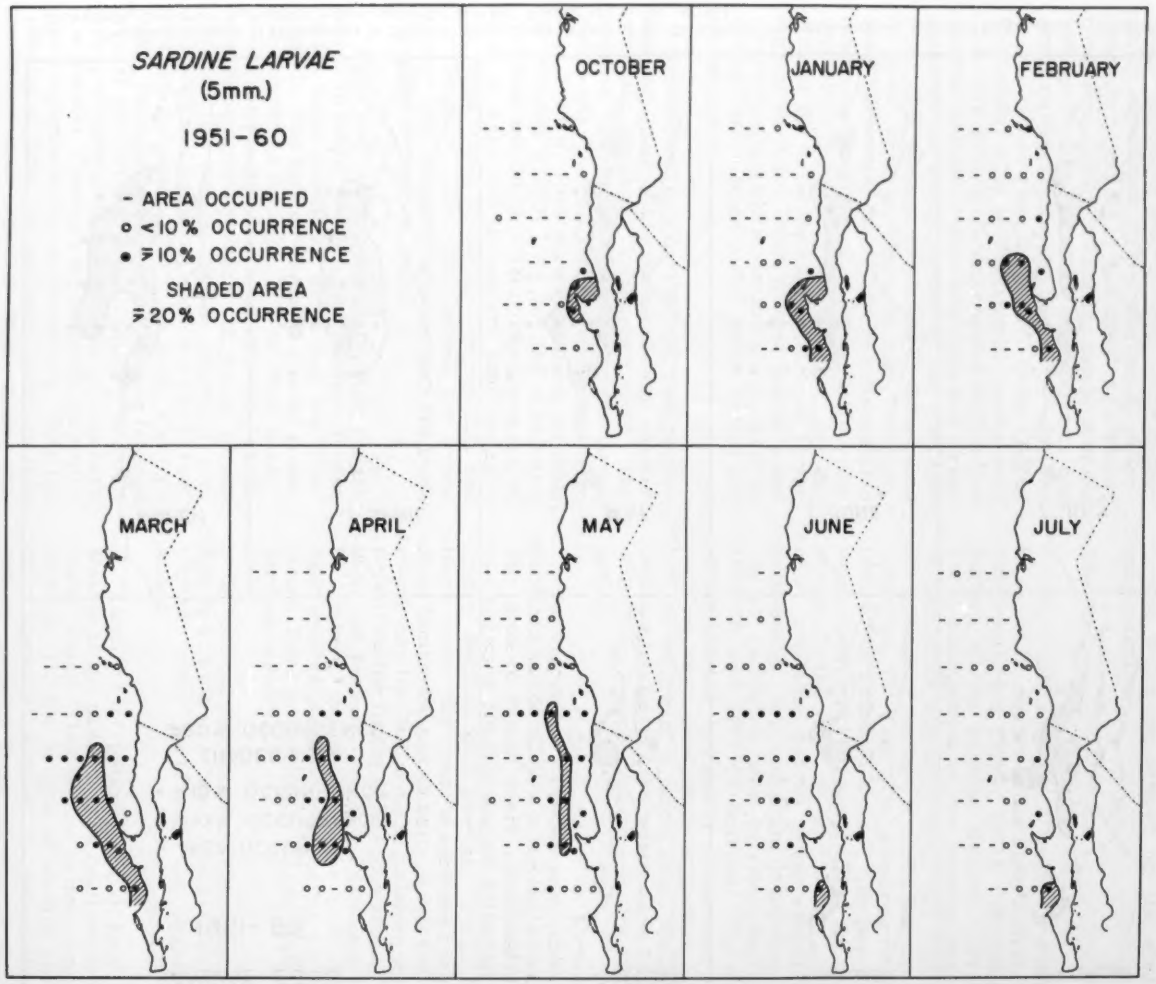

Fig. 2 - Percent occurrence of 5-mm sardine larvae in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

quantities of jack mackerel and squid. In 1968, pelagic wetfish resources (including squid) supported a catch of approximately 115 million pounds valued at over $3.1 million to the fishermen.

"A number of interrelationships exists in the wetfish fishery. Since the same basic fleet harvests different wetfish species, economic factors, changing abundance and variation in local availability, and fishing restrictions on one species may affect the fishing pressure placed upon others in the group. The northern anchovy is the sardine's principal competitor for food and occupies the same general geographic range. The increase of the anchovy population size followed closely the decline of sardine stocks. This indicates the possibility of increasing sardine stocks by increasing fishing pressures on anchovies and eliminating them on sardines. An experimental fishery to do this has been proposed, but only has been initiated on a partial basis because of political and sociological reasons."

The experimental anchovy fishery was a recommendation for 200,000 tons, discussed briefly by us (Kramer and Smith, 1971a) and detailed by Messersmith (1969).

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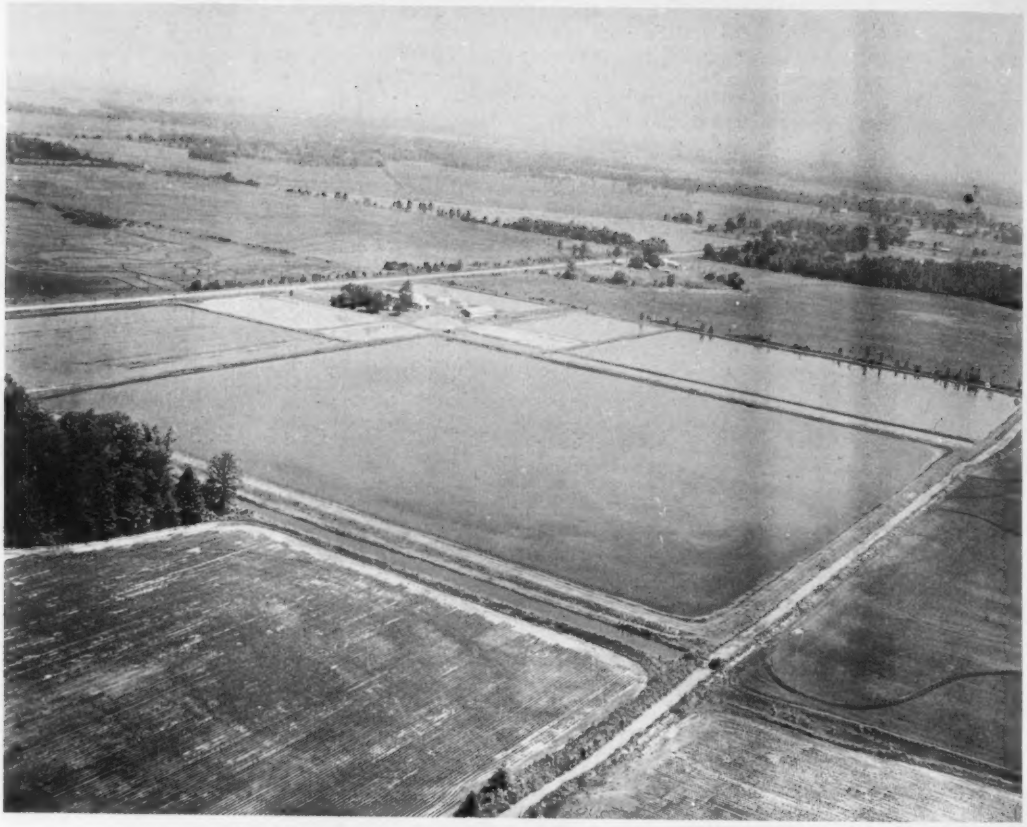


Catfish farms now form geometric patterns across the Southern United States.

POND-RAISED CHANNEL CATFISH:
The Design of Boom-Mounted Brailers to Move Them

Donald C. Greenland
Earnest T. Carlton
Robert L. Gill
Sammie L. Weaver

Boom-mounted fish brailers are commonly used for loading pond-raised channel catfish (Ictalurus punctatus) onto haul trucks during harvesting operations. Many different brailer designs are used and the methods of filling them with fish vary. Oftentimes, brailers are suspended in the water next to fish confined in a seine and are filled by a couple of men using dip nets. Some farmers use detachable brailers. Workers carry these units into a batch of seine fish, scoop them up, and then fasten the loaded brailer back onto the lift cable. When fish are harvested in live cars, brailers can be lowered directly into them and the fish can be crowded into the brailers by taking up slack in the live car.

Two brailer designs have gradually developed at the Kelso Station, Arkansas, over the past several years. To develop these, we used data obtained in our harvesting demonstrations, and information given us by farmers actively engaged in producing channel catfish. These two designs, one for working fish in a seine, the other for loading catfish out of live cars, have proved successful in our operations. They could be used in most situations where the fish are close enough to be reached with a boom.

DESIGN CONSIDERATIONS

Harvesting conditions dictate many of the design features required in a brailer. For example, a brailer used for dipping fish out of a live car would not be suitable for chasing fish around inside a seine. A brailer used with a live car must fit inside the live car; it must have the ability to collapse into a rather small area because room is limited. The brailer-suspension system must have enough distance between spreader and brailer so brailer can be tipped sideways for dipping fish. Also, adequate clearance must be allowed so workers can manipulate the brailer in the live car--without the spreader, in-line scales, or boom hook interfering with their activities. Brailers used to chase fish bundled up in a seine need to be light, maneuverable, and so constructed that men in waders can easily handle them. Here the length of the bridle system is not a critical factor in loading. It is necessary, however, that the hardware used for detaching and attaching be operated easily by men wearing cumbersome gloves. Brailers suspended permanently from the lift cable, and filled by dip nets, need a suspension bridle that will allow adequate clearance for the dip nets; the top rim of the brailer must be sturdy enough to take the weight of the dip nets full of fish.

Other Factors Influence Design

Several other factors influence brailer design. For example, the capacity of the boom limits the quantity of fish, and thus the size of the brailer. Also, the size of the fish to be handled would influence the diameter of drain holes or, if webbing is used, the mesh size. Specialized brailers made for skidding along muddy pond bottoms are sometimes used where ponds are harvested by water draw-down methods and the fish are isolated in pools too far from the bank to reach with the boom.

The height and length of the boom used, and the height of the haul-truck compartments, often limit the top-to-bottom dimension of a brailer. If there is only a 3-foot clearance between the maximum boom height and the hatch opening of a haul truck, the brailer must be made to fit into this space.

D. C. Greenland is Fishery Biologist; R. L. Gill, Fishery Methods and Equipment Specialist; E. T. Carlton and S. L. Weaver, Laborers, NMFS, P.O. Box 711, Rohwer, Arkansas 71666.

COMMERCIAL FISHERIES REVIEW
Reprint No. 923

Also, if the haul truck hatch is 2-foot-square, then the brailer opening should be somewhat smaller so it can be centered easily over the opening.

DESIGN CRITERIA OF BRAILER USED FOR LOADING FISH OUT OF A SEINE

The brailer shown in Figure 1 is light, maneuverable, and is used for loading fish out of a seine. Workers detach the unit and, using it as a dip net, fill the brailer by scooping up fish concentrated inside the seine. Hooks are located at the terminal end of the bridle to allow easy removal of the brailer. The wooden spreader keeps the weight of fish from collapsing the top ring when lifting a load--and it keeps the hooks positioned and adds rigidity to the bridle to facilitate hooking and unhooking the brailer. The 5-foot-length of the brailer and the $\frac{3}{4}$-inch plywood bottom ease the job of moving the unit through the water when pursuing fish. The mesh brailer body puts the bottom of the unit far enough back so fishermen can hold the top ring and work the fish without the bottom bagging around their ankles. When in the water, the wooden bottom offsets some of the weight of the metal frames and the support chains, adding to the brailer's mobility.

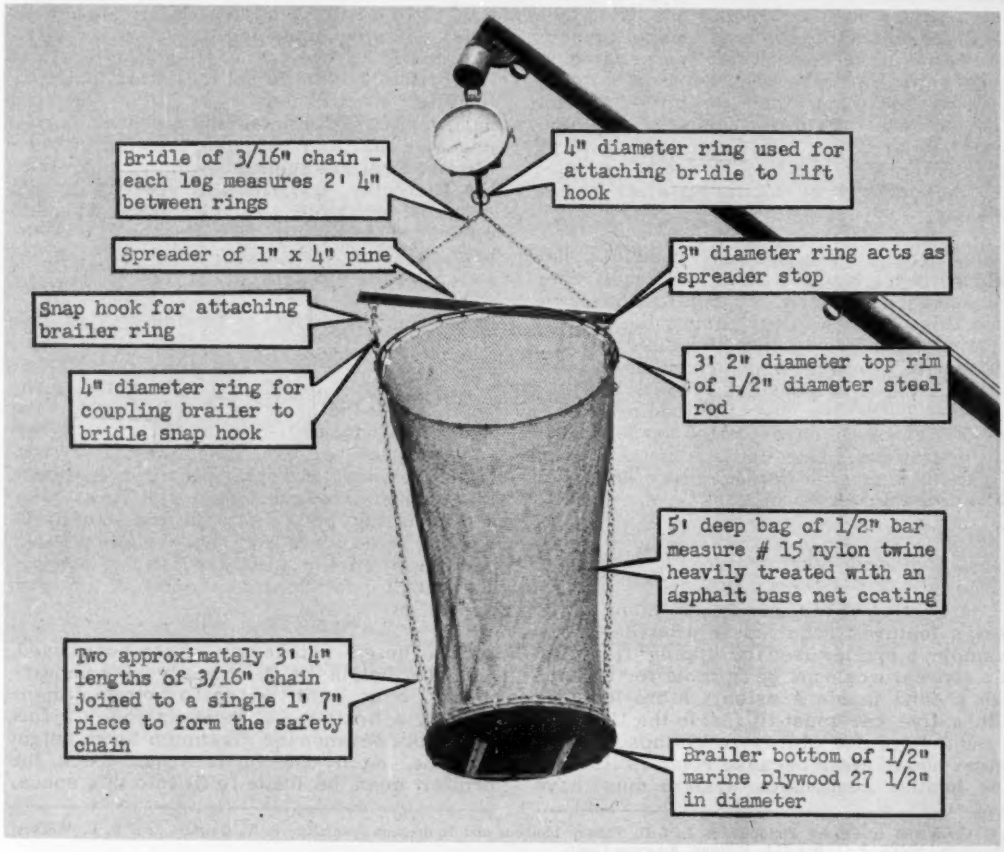

Bridle of 3/16" chain - each leg measures 2' 4" between rings
4" diameter ring used for attaching bridle to lift hook
Spreader of 1" x 4" pine
3" diameter ring acts as spreader stop
Snap hook for attaching brailer ring
3' 2" diameter top rim of 1/2" diameter steel rod
4" diameter ring for coupling brailer to bridle snap hook
5' deep bag of 1/2" bar measure # 15 nylon twine heavily treated with an asphalt base net coating
Two approximately 3' 4" lengths of 3/16" chain joined to a single 1' 7" piece to form the safety chain
Brailer bottom of 1/2" marine plywood 27 1/2" in diameter

Fig. 1 - Brailer designed for removing channel catfish held in a seine net.

Construction Details

Construction details of this brailer are shown in Figure 2. Note that safety chains are included to protect the mesh from too-much stress caused by a heavy fish load. When attaching these chains, a slight amount of slack should be left in them so, when fish are put into the brailer, the mesh sides can stretch. The resulting tension eliminates much of the bagging around the brailer bottom caused by the weight of the fish on the mesh sides; it becomes easier to empty fish out of the brailer.

The brailer shown in Figures 1 and 2 is fitted with a slide door for emptying fish. A brailer with such a large capacity makes it almost necessary to have a door that can be used to throttle the flow of fish. The quantity of fish that can be loaded into the brailer will often exceed the capacity of haul-truck compartments. For example, we have loaded over 500 pounds of fish in this brailer and hoisted them up to haul trucks having 200-pound-capacity compartments. By being able to control the flow of fish from the brailer, the fish were put in three different compartments. With a quick-release gate, all fish would have gone into one compartment, and we would have had to distribute them into the other compartments with a dip net.

DESIGN CRITERIA OF BRAILER FOR USE WITH LIVE CARS

When harvesting fish using live cars, brailers can be lowered right into the live cars and be loaded with fish. A brailer used for this purpose is shown in Figure 3. A wooden spreader is used to keep the weight of the load from crushing the top ring when the brailer is full of fish. Note the spreader is raised high above the brailer to keep it out of the way of the loading activity when the brailer is submerged in the live car.

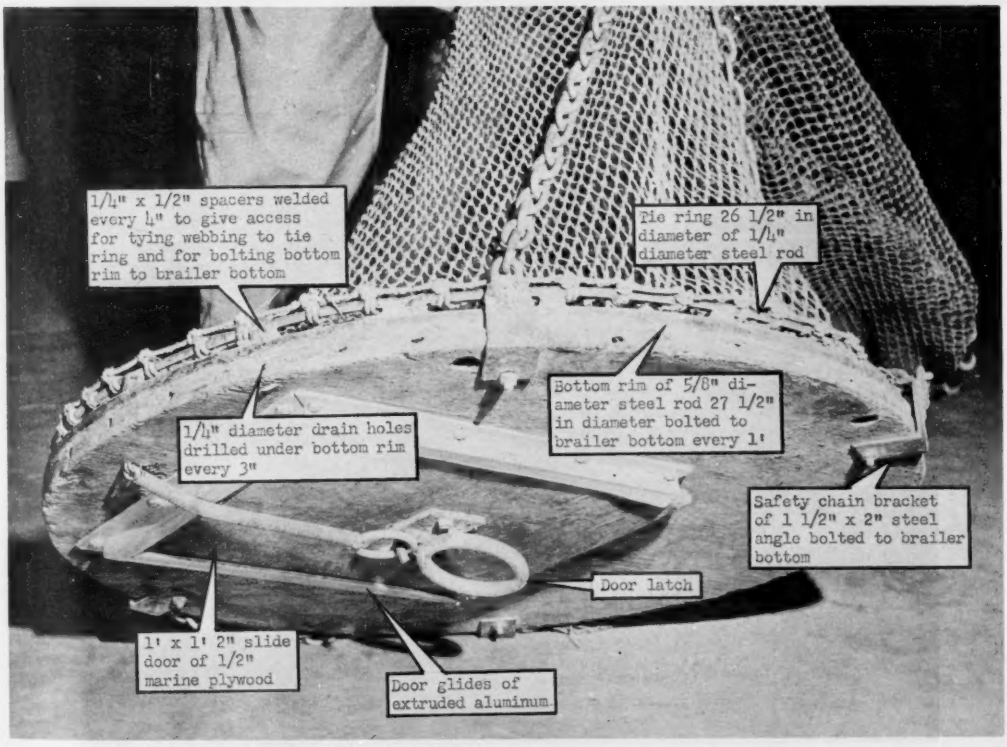

1/4" x 1/2" spacers welded every 4" to give access for tying webbing to tie ring and for bolting bottom rim to brailer bottom
Tie ring 26 1/2" in diameter of 1/4" diameter steel rod
Bottom rim of 5/8" diameter steel rod 27 1/2" in diameter bolted to brailer bottom every 1'
1/4" diameter drain holes drilled under bottom rim every 3"
Safety chain bracket of 1 1/2" x 2" steel angle bolted to brailer bottom
Door latch
1' x 1' 2" slide door of 1/2" marine plywood
Door glides of extruded aluminum

Fig. 2 - Details of brailer designed for removing channel catfish from a seine.

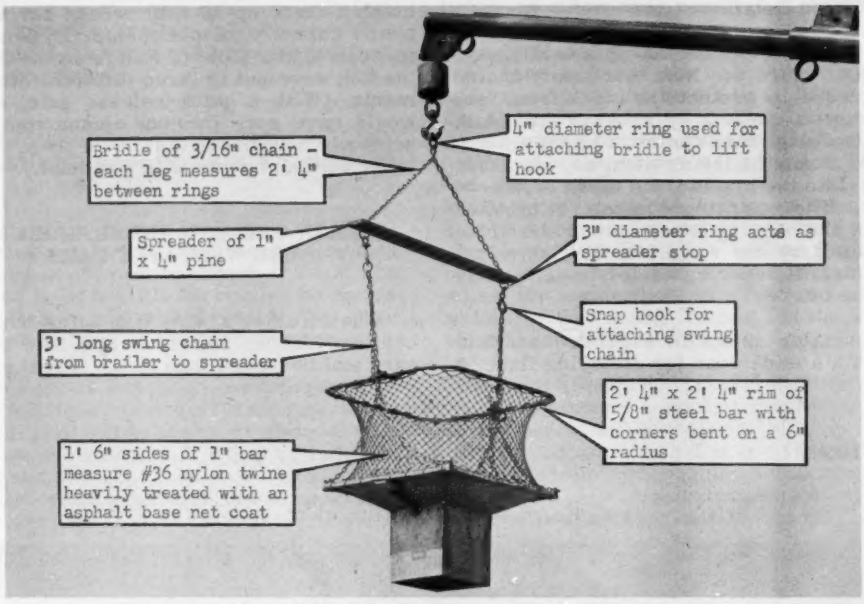

Bridle of 3/16" chain - each leg measures 2' 4" between rings
4" diameter ring used for attaching bridle to lift hook
Spreader of 1" x 4" pine
3" diameter ring acts as spreader stop
Snap hook for attaching swing chain
3' long swing chain from brailer to spreader
2' 4" x 2' 4" rim of 5/8" steel bar with corners bent on a 6" radius
1' 6" sides of 1" bar measure #36 nylon twine heavily treated with an asphalt base net coat

Fig. 3 - Brailer designed for removing channel catfish from live cars.

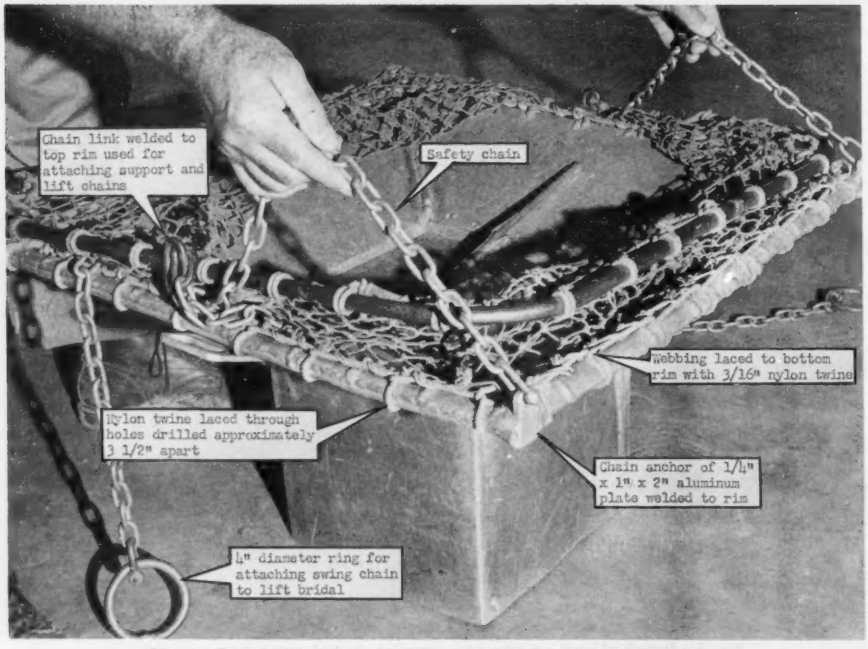

Chain link welded to top rim used for attaching support and lift chains
Safety chain
Webbing laced to bottom rim with 3/16" nylon twine
Nylon twine laced through holes drilled approximately 3 1/2" apart
Chain anchor of 1/4" x 1" x 2" aluminum plate welded to rim
4" diameter ring for attaching swing chain to lift bridal

Fig. 4 - Details of brailer designed for removing channel catfish from live cars.

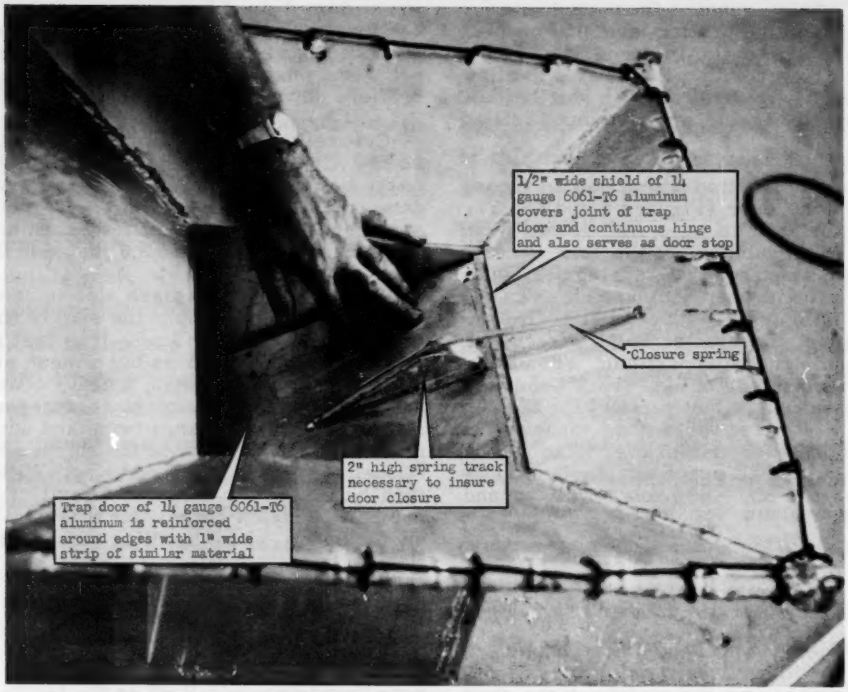

1/2" wide shield of 14 gauge 6061-T6 aluminum covers joint of trap door and continuous hinge and also serves as door stop
Closure spring
2" high spring track necessary to insure door closure
Trap door of 14 gauge 6061-T6 aluminum is reinforced around edges with 1" wide strip of similar material

Fig. 5 - Details of brailer designed for removing channel catfish from live cars.

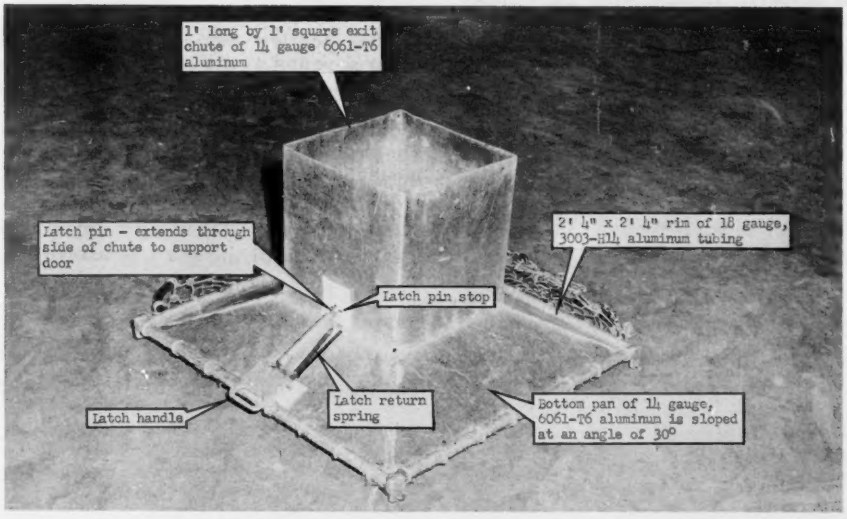

1' long by 1' square exit chute of 14 gauge 6061-T6 aluminum
Latch pin - extends through side of chute to support door
2' 4" x 2' 4" rim of 18 gauge, 3003-H14 aluminum tubing
Latch pin stop
Latch handle
Latch return spring
Bottom pan of 14 gauge, 6061-T6 aluminum is sloped at an angle of 30°

Fig. 6 - Details of brailer designed for removing channel catfish from live cars.

Safety chains running from each corner (Figure 4) keep the brailer level and support the load when the brailer is full of fish. These chains are rigged with a little slack to allow the mesh body of the brailer to stretch, and thus eliminate bagging, when the unit is filled with fish.

This brailer is fitted with a quick-release latch and trap door (Figures 5 and 6). The hinge is designed to keep fish spines from catching in the slot where the door joins as the brailer empties. The spring design allows the gate to snap back and close as the last fish falls through. A funnel section on the bottom of the brailer helps direct fish into the haul-truck compartment. To eliminate the over-filling of haul-truck compartments (discussed in last section) the brailer height is restricted to limit its capacity. A maximum load for this brailer is about 350 pounds. In actual practice, the brailer is seldom "topped off," and loads rarely exceed 250 pounds.

SUMMARY

The two designs presented here have been used in many different harvesting operations. With innovations and modifications, they should work in almost any harvesting situation. They have the capacity for moving fish safely and quickly. In fact, when harvesting large quantities, fish usually can be loaded out with boom-mounted brailers much faster than haul trucks can be supplied to carry them. In one of our harvesting demonstrations, channel catfish were shifted from live cars across the levee into an adjacent pond; a live-car-type brailer was used similar to the one described in this paper. In this instance, 40,000 pounds of channel catfish were moved in $5\frac{1}{2}$ hours--a rate of about 7,300 pounds per hour. In several harvesting operations, we have loaded out 5,000 pounds per hour into waiting haul trucks, using the brailers described here.

Generally, large brailers can be loaded so heavily that it is possible to damage fish on the bottom layer. We don't have any firm data on this problem. However, from our experience, it appears fish shouldn't be stacked higher than 2.5 to 3.0 feet in brailers.

The choice of what mesh size to use for a brailer bag depends upon the size of fish the brailer will be used to load. It is best to use as large a twine and as big a mesh size as fish size will allow. Also, a heavy coat of an asphalt-base net treatment is necessary to seal the webbing. Large twine and adequate net treatment will reduce the number of fish "finned" or gilled in the webbing. With one-inch bar measure mesh of heavily treated number 36 nylon twine, there is almost no entanglement when handling process-sized fish.

We have never had the mesh body of a brailer split open when loaded. But this is a possibility if the mesh is not checked properly for holes and abrasion. We have had fish hang on outside and fall off as the brailer was lifted. Do not swing over working perosnnel. Men in the pond should keep an eye out for "hung" fish.

The brailer designs have evolved over several years at the Kelso Station. We have incorporated the ideas of many fish farmers in these units. Their suggestions have aided greatly in the development of these brailers. The brailers have been field tested with many thousands of pounds of channel catfish; their basic designs have proved sound.

FISHERY PRODUCTS SITUATION

Consumption of fishery products is expected to be off a little in 1971. Per-capita sales likely will be near 11.2 pounds--down from 11.4 pounds in 1970. Consumption had been on the rise for three consecutive years.

Several factors account for the slight drop in sales this year. At the retail level, sales have been sluggish due mostly to record high prices. Retail prices advanced sharply in 1970 and were averaging as much as 10% higher prior to the wage-price freeze. Prices of most fish fillets are considerably higher than whole broilers and, in most cases, higher than chicken parts. Abundant pork supplies and resulting lower prices made fish more expensive than many cuts of pork during much of 1971. Such price comparisons do not take into account the fact that a fish fillet is 100% edible--no bones or fat. Also accounting for some retail sales resistance were periodic reports of mercury in fish.

Lack of Supplies

Institutional and food-service sales are off in 1971. These markets have been affected less by higher prices than by a lack of supplies. Sales would have been heavier, despite higher prices, if imported raw materials had been available. Combined sales of fish sticks and portions will show little growth over 1970--a direct result of United States processors being unable to increase purchases of frozen blocks from Canada and Scandinavia. The fastest-growing segment of the U.S. fisheries market in recent years has been the fish-and-chips franchises. Sales in this area are off because companies are unable to purchase increasing quantities of imported fillets.

Imports of edible fishery products were off about 3% through August. Because of a leveling off in world catches of many fish species, and increasing demand in other countries, record high prices on the U.S. market were not able to attract more imports in 1971. Since U.S. fish consumption is about 55%-dependent on imports, the world supply-and-demand situation has a direct influence on domestic consumption. A prolonged East and Gulf Coast dock strike could reduce fish supplies even further in the fourth quarter of 1971.

Edible-Fish Landings Down

In addition to lower imports, U.S. landings of edible fish are also down in 1971. Domestic production of tuna may be off as much as 14%, shrimp by 4%, and salmon landings likely will be a third below 1970. Haddock landings continue downward--possibly off a fifth from 1970. Flounders may be down a tenth, and whiting landings are running only a little better than half those of last year. Modest increases in cod, ocean perch, and pollock will not be able to make up the deficits in other groundfish. Halibut landings will also be off.

--Donald R. Whitaker
NMFS Market Research & Services Division

ALASKA'S VAST FISHERY RESOURCES PRESENT CHALLENGES

Some obstacles must be overcome before Alaska can fully utilize its enormous fishery resources, believes Wallace H. Noerenberg, Commissioner, Department of Fish and Game.

For example, the runs of pink and chum salmon in Southeastern Alaska have not responded to state management nearly as well as they did in the central and western regions. The Commissioner says management techniques must be modified. This will be guided by research findings now becoming available. Milder weather would help. A series of harsh winters killed many fish and cancelled rehabilitation efforts.

Other signs point to the development of Southeastern Alaska pink and chum salmon runs: intensive stream-clearance projects, saltwater rearing units, and the expanded hatchery program.

Salmon Industry's Role

The Commissioner asked the salmon industry to recognize that more processing capacity will be needed to handle the larger runs expected to result from state efforts.

State-industry cooperation also could result in greater utilization of shrimp, scallops, black cod, and herring.

Many Salmon Not Canned

There is a steady trend toward diverting larger parts of the salmon catches from canning to other processed forms. The latter are worth much more per pound. This trend "will undoubtedly continue."

In the 1960s, processing of noncanned salmon rose from 10 million to 30 million pounds a year. Air shipment of several species of fresh salmon to Europe will be a key to more development. The U.S. and Japanese markets for fresh and frozen products "will increase greatly."

Sport Fishermen

Commissioner Noerenberg said that "the rapidly increasing pressure from sport fishermen must also be recognized as an important factor in the management of our fishery resources." The sport catch must be provided for; at the same time, the escapement necessary for sustained yield must be maintained.

In 1970, the sport catch of salmon was 75,000. This "could well jump to 250,000 or more by 1980." With proper management, this should pose no problem to a fishery capable of catches topping 40 million fish a year.

Too Many Fishermen

The Commissioner believes there are too many fishermen, "a key socio-economic problem." Also, he anticipates that the 1971 legislature will do something to solve the problem of excessive gear.

Arctic North of Bristol Bay

The Department of Fish and Game "will face a real crisis" in the Arctic north of Bristol Bay when money paid to the natives for settling land claims begins to be used for developing the fisheries there more intensively. The Department has little staff and information to guide and control those fisheries, especially the marine species.

ALASKA's TANNER CRAB LANDINGS RISE BUT MARKET IS POOR

Since the fishery began in 1968, landings of tanner crabs in Alaska "have increased dramatically," but poor market conditions continue to impede full use of this important seafood resource. So states a Department of Fish and Game publication.

Tanner crab landings increased from less than 200,000 pounds in 1967 to 11.2 million pounds in 1969. But a poor market held 1970 landings to 14.5 million pounds.

King Crab Declines

This increase in tanner-crab catch was related directly to a decline of king-crab catches. As the latter declined after 1967, their fishermen focused on the tanner crab for the first time. The industry boomed, particularly around Kodiak.

Kodiak No. 1

Kodiak continues to lead in tanner-crab production: 61% of state catch in 1969. However, other areas--Prince William Sound, Cook Inlet, and the Bering Sea--had greater relative production increases during 1969 and 1970.

Market Weak

Poor market conditions remain the largest hindrance to growth of the tanner-crab fishery. Processing and marketing problems include "uneconomical extraction of meat from the shell, relatively low consumer acceptance, competition from imported crab, and a black encrustment on the crab shell."

Curtailment of landings in May 1970 reflected a poor market. This resulted largely from the result of Japanese and eastern Canadian tanner-crab imports. Japanese and Soviet crab fleets took 17.7 and 6.2 million tanner crabs from waters of the Alaskan continental shelf; for the same period, the total U. S. catch was 3.8 million crabs.

Tanner's Price Vs. Others'

Another market indicator is the price of tanner crab compared to dungeness and king crab. Fishermen now receive about 60% more for king crab than tanner. Dungeness is 33% higher.

The tanner-crab shell encrustment apparently is harmless to the meat. But it causes a problem during processing because it is difficult to keep the black nodules off cannery meat belts. This problem is under study.

Processing and marketing problems have caused individual processors to impose size limits and catch quotas on their own fleets. These limits serve in place of state regulations to protect male breeding stocks--but they may be curtailing full use of the resource.

KODIAK HARBOR POLLUTION ATTRACTS EPA

Representatives of the Environmental Protection Agency's Division of Enforcement called a meeting in Juneau, Alaska, this summer to advise NMFS and Alaska on coming steps to reduce pollution of Kodiak harbor by seafood wastes.

Processing plants are concentrated at Kodiak. Waste treatment and disposal facilities are lacking. So, in terms of pollution by seafood wastes, this is the State's worst problem area.

EPA has met with processors and local government, but it believes that no real progress has been made--and that effective action must begin now. First, EPA plans to require processors to remove solid wastes from plant effluents. Also, it will require monthly progress reports from processors showing what they have done and spent to curtail pollution.

FIRST U.S. SURVEY OF INDUSTRIAL-WASTEWATER DISCHARGES BEGINS

The Environmental Protection Agency (EPA) has begun the first large-scale Federal survey of industrial-waste discharges into U.S. waterways to determine the extent of water pollution by industry. Responses to the survey are voluntary.

Known as the "Report of Industrial Wastewater Discharges," it began with the mailing of forms and instructions to 10,000 industries. These are the heaviest users of water--about 90% of all water used for industrial purposes. Return of the completed survey forms is being requested within 90 days after receipt.

7 Major Industrial Categories

The 7 major industrial categories are: food, textile and mill products, paper, chemicals, petroleum refining, primary metal industries, and transportation equipment, including motor vehicles and motor-vehicle equipment.

"The data gathered in the voluntary wastewater survey will be computerized and made available for use by Federal, State, and other governmental agencies in support of water pollution control and abatement programs," W. D. Ruckelshaus, EPA Administrator, said. Also, all information received regarding quantity and quality of discharge will be open to public inspection.

The information obtained will complement data gathered under Refuse Act Permit Program launched July 1, 1971, by U.S. Army Corps of Engineers, assisted by EPA, in a coordinated effort to control or eliminate major industrial sources of water pollution.

Eventually, all data on industrial discharges will be consolidated into a single Federal industrial-wastewater inventory.

1899 Refuse Act

The mandatory permit program was set up in conjunction with the 1899 Refuse Act. Under it, only those plants that discharge wastes into navigable waters and their tributaries are required to apply for a discharge permit. They must submit data on the nature of the discharge. It is estimated that 40,000 to 50,000 plants require such permits covering over 300,000 discharge outflows.

The EPA survey will attempt to obtain such information from a much broader range of industrial operations: particularly the estimated 44% of the plants that discharge waste into municipal sewerage systems. These plants are exempt from permit requirement. Industries that provide waste data in filing permit applications will not be asked to supply the same information again for the waste-water survey.

GREAT LAKES WILL HAVE A SECOND ICEBREAKER THIS WINTER

An additional icebreaker will be moved into the Great Lakes this winter to support the Transportation Department's study of extending the shipping season in the Great Lakes-St. Lawrence Seaway System.

Secretary of Transportation John A. Volpe said the 6,515-ton U.S. Coast Guard Cutter (CGC) 'Edisto', operating out of Boston, will be reassigned to Milwaukee, Wisc., December 1. The Edisto will support the CGC 'Mackinaw', homeported at Cheboygan, Michigan, in opening shipping lanes during the winter.

Extending Season

Secretary Volpe said it is his Department's business to incorporate water transportation into a balanced national transportation system.

Canada, several U.S. agencies, and private groups are cooperating with the Department of Transportation in the season-extension program.

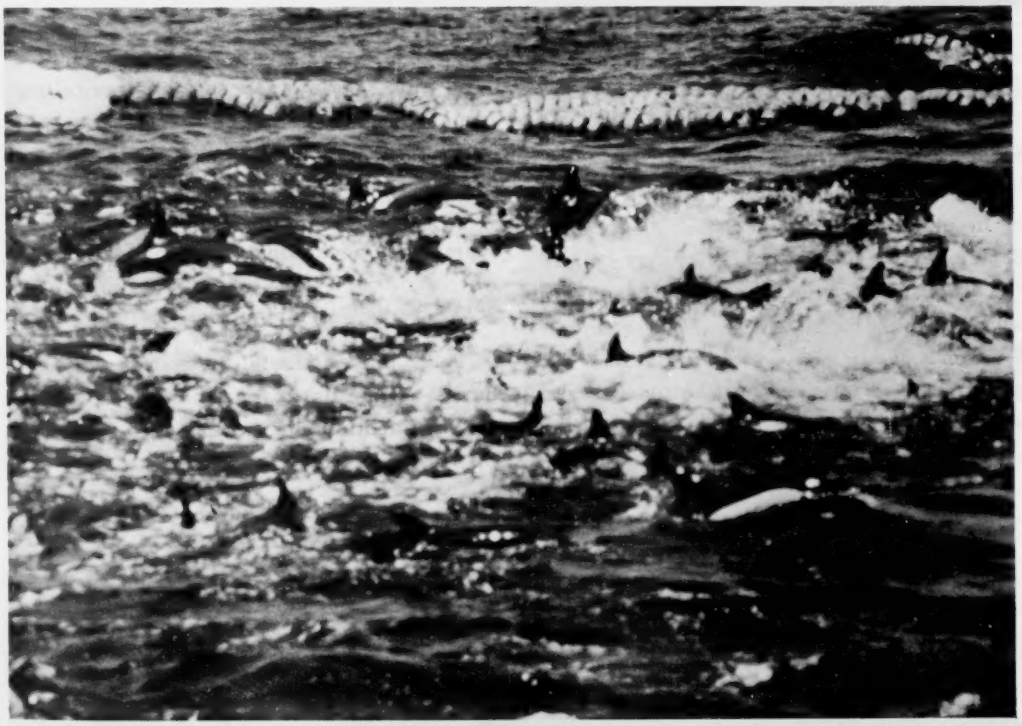
The Edisto is a 269-foot icebreaker of the "Wind" class. In recent years, it has been escorting shipping and performing scientific and oceanographic studies in the Arctic Ocean. It will continue these missions each summer.

PORPOISES SAVED FROM TUNA SEINE BY UNDERWATER SOUNDS

Scientists of the Naval Undersea Center (NUC), San Diego, may have helped NMFS discover a way to save thousands of porpoises normally killed each year by tuna fishing. Commercial species of tuna and porpoises travel together. When a seine encircles a tuna school, it nearly always captures porpoises too. Despite fishermen's attempts to save them, hundreds of thousands of porpoises, attractive animals without commercial value, are destroyed each year, estimates William F. Perrin, NMFS, La Jolla, Calif.

Working with Perrin, NUC scientists Dr. James F. Fish and Dr. William C. Cummings used underwater sound equipment to play back the sounds of killer whales--and successfully drive the porpoises from the huge tuna seine.

Although porpoises have a remarkable ability to leap from the water, they will not so much as slip over the top of the seine at the water's surface. Apparently, porpoises fear the net very much and will not voluntarily approach it or the floatline. As the net is drawn up, crowding the encircled school,



Whitebelly porpoises are caught in tuna seines during fishing operations. Many become entangle and drown. Annual losses reach many thousands.

the frantically moving porpoises near the net become entangled and drown.

Sounds of Killer Whales

Cummings and Fish had disclosed earlier that marine mammals apparently recognize the sounds of killer whales as a danger sign. Killer whales are known to attack and eat other whales and seals. By recording killer-whale "screams" and playing them back to such marine mammals as porpoises, white whales, and gray whales, the two NUC scientists have been able to direct the movements of wild animals. One such experiment may save many young salmon from the highly predaceous white whales in Alaskan waters.

NMFS Gets NUC Help

NMFS asked NUC to help develop a stimulus for herding porpoises through an NMFS-designed escape gate. Previous NMFS experiments with non-biological sounds were unsuccessful.

In playback experiments at the end of September, the NMFS-chartered tuna clipper 'Westport' was guided to large schools of whitebelly porpoises by NUC scientist William E. Evans. He used information from his studies of porpoise migration in local waters. A Navy helicopter also helped find the animals.

Porpoises Escape

The purse seine encircled schools of up to 1000 porpoises. Most animals refused to leave through the unique gate until Fish and Cummings played back the killer-whale sounds with high-powered amplifiers and special underwater speakers designed by NUC's Wesley L. Angeloff. The captured porpoises swam away quickly from the sound source--and out the gate. When free of the net, the porpoises jumped out of the water as high as 15 ft. and continued to jump and dive until they were out of sight. Why the porpoises will not jump the few inches to escape the seine remains a mystery.

The scientists reported that their experiments were very successful. They caution that "more work is necessary before telling whether or not the method will be practical in actual fishing operations. We have no way of knowing how many tuna will accompany the porpoises out of the seine, but the method seems very promising at this time."

NMFS To Instal Equipment

NMFS plans to instal the sound equipment aboard a tuna clipper for prolonged observation by scientists and fishermen.

BLUE FISH ATTACK YELLOWTAIL FLOUNDER

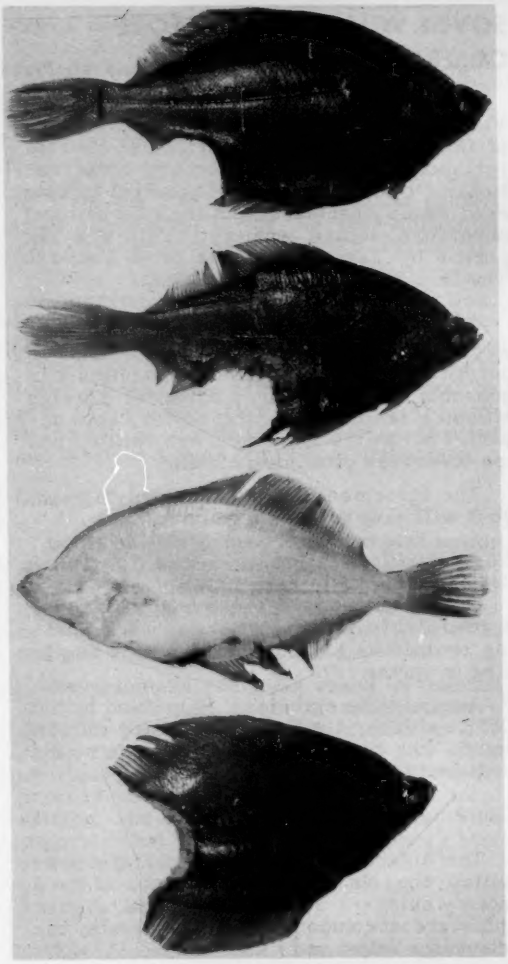
A Long Island fisherman who caught wounded yellowtail flounder all summer claims severe bites on yellowtail resulted from attacks by bluefish. Norman Edwards, captain of the 'Robert E.', Amagansett, L.I., reported that his medium-sized trawler brought in one or two dozen severely bitten yellowtail per tow.

"The flounder are sometimes driven out of particular areas because of the bluefish attacks," he told John V. Mahoney, NMFS, New Bedford, Mass.

Unusual Location for Bluefish

Bluefish continue killing and feeding even on a full stomach but, usually, they do not frequent the ocean bottom, the yellowtail's habitat. There were more bluefish this year and NMFS fishery biologists say it is highly likely these fish have gone deeper in the water. The evidence of their frenzied biting and snapping is present there.

Specimens of mutilated flounders, caught alive off Montauk Point in 30 fathoms, are being studied at the NMFS laboratory in Woods Hole, Mass. Two specimens have wounds that healed partially. The biologists speculate that these fish would have survived--had they escaped capture.



Yellowtail flounder caught by Long Island fisherman who claims flounder have been attacked by bluefish. (Robert K. Brigham)

INTERNATIONAL

SOVIET WHALERS SAIL BEFORE OBSERVER PLAN IS READY

Three Soviet whaling fleets sailed from Vladivostok for the Antarctic in the first week of October. Their departure frustrated for yet another season the efforts by conservationists over two decades to protect threatened whale species by putting international observers aboard whalers. This was reported by James P. Sterba from Tokyo to The New York Times on Oct. 7.

In September, Soviet, Japanese, and Norwegian negotiators initialed an agreement to permit international observers to check this season's kill. However, a Japanese Foreign Ministry official said, the Soviet fleets departed before the agreement was ratified and the observers could board them.

The agreement was valid for only a year, so it will have to be renegotiated.

North Pacific Whaling

The Soviet and Japanese negotiators had agreed also to exchange observers for whaling operations in the North Pacific beginning in spring 1972.

Assuming the agreement is ratified by the USSR and Japan, the Foreign Ministry official noted, "the North Pacific will have to be the first test case."

The Antarctic Agreement

The Antarctic agreement would have permitted one observer aboard each of the 6 factory ships--3 Soviet, 3 Japanese. These ships are accompanied by killer boats, refrigerator ships, and tankers.

Most of today's whaling is in the Antarctic. It is done by the USSR and Japan.

Observers' Role

The observers would have made sure that the whalers respected the quotas set by the International Whaling Commission--and that protected whales, mothers with babies and undersized whales, were not killed. The major whaling nations resisted the international observer plan.

As the herds have decreased the international commission lowered quotas. But conservationists state that quotas are too high and, even so, some whalers ignore them.

U.S. AND POLAND EXTEND FISHERY AGREEMENT

The United States and Poland agreed on Oct. 1 to extend their agreement on fisheries off the U.S. middle Atlantic coast, the U.S. State Dept. reported on that date. The agreement was first concluded in June 1969, modified and extended in June 1970, then extended through June 30, 1972.

It protects species of direct concern to U.S. sport and commercial fishermen from North Carolina to New England.

What Agreement Covers

The species covered by the agreement are scup, flounder, hake, black sea bass, menhaden, river herring, and yellowtail flounder. Polish fishermen will not fish these species. They will take special precautions to avoid depleting resources throughout the year. Also, they will continue to refrain from fishing during $3\frac{1}{2}$ winter months in a large offshore area where bottom species concentrate early in the year.

U.S. Concessions

In return, the U.S. will continue to permit Polish fishermen to transfer their fish catch and supplies between vessels within three areas inside the U.S. contiguous fishery zone. Also, the U.S. will continue to facilitate calls of Polish fishing vessels to certain U.S. ports to obtain supplies.

Voluntary Enforcement

The U.S. and Poland also agreed to implement a voluntary enforcement scheme for the Agreement. Their inspectors will be able to board fishing vessels in the mid-Atlantic to check compliance with the agreement.

JAPAN EVALUATES EFFECTS OF U.S. 10% SURCHARGE

The U.S. is Japan's best market for fishery products. In 1970, the U.S. took roughly 30%, a record, of Japan's fishery exports worth US$128 million. The announcement of President Nixon's 10% import surcharge on August 15 and the following revaluation of the yen on August 28 shocked and confused the fishing industry.

The industry has had time to evaluate the effects on its markets. With the exception of canned tuna, it appears that the industry, although it will have some problems, will not be affected seriously.

Canned Tuna

This will not be a good year for firms dependent on exports of canned tuna-in-brine to the U.S. The discovery of excess mercury in tuna (over 0.5 part per million) in late 1970 hurt exports. Between January and July 1971, the U.S. Food and Drug Administration (FDA) seized about 35,000 cases of canned tuna-in-brine because of excess mercury.

The Japanese were able to offset this partially by switching to the packing of smaller-sized tuna considered less likely to contain excess mercury. However, while testing for mercury contamination, the FDA uncovered samples of "decomposed" canned tuna, and seized 92,231 cases, as of August 12.

The FDA testing procedures are based on the smell of "off odors". It has not been able to pinpoint the origin of the decomposition. So the Japanese are unable to correct this problem. It has caused much uncertainty and been extremely costly. Japanese traders not only lose a market, but they must also pay shipping costs of products recalled from the U.S. And then they must sell their products in an already-glutted domestic market.

10% Surcharge & Yen Revaluation

These problems were compounded by the U.S. 10% surcharge. This raised the duty on canned tuna-in-brine from 7% to 17%. Then, the yen revaluation[1/] increased the cost of exporting canned tuna to the U.S. by another 6%. The results have been growing stockpiles of unsold tuna, uncertainty about market demand and production goals, and shutdowns and/or slowdowns by major canning firms. Smaller canners are said to be facing serious economic problem; some bankruptcies have been reported.

Frozen Tuna

The frozen-tuna export industry may benefit from the 10% surcharge. Unlike canned tuna, its exports to the U.S. ($42 million in 1970) are exempted from the U.S. surcharge.

In the past, this industry faced stiff competition from canners for tuna supplies. Now, because of 10% surcharge, the canning industry cannot pay as much as before, so the frozen tuna industry can buy frozen tuna at lower prices. As a result, the latter may be able to increase sales to the U.S., although it too will be affected by the yen revaluation and other problems facing tuna fishermen.

Canned Crab & Pink Salmon

Some sales of canned crab and pink salmon to the U.S. have been made since August 15. These industries generally are confident that they can continue to export to the U.S., or to find new markets in Europe, Australia, and elsewhere, with little, if any, loss.

Nevertheless, 650,000 cases of canned salmon and crab, worth $10 million, were stockpiled in Japan in early October. The Japan Central Cooperative Bank has made an emergency loan of $17 million to help processors with stockpiles of canned tuna, salmon, and crab to meet expenses. This suggests that this segment of industry also has problems.

Traders' Strategy

The Japanese traders' strategy appeared twofold: (1) wait for U.S. stockpiles of canned salmon and crab to decrease to point where price and demand for Japanese products will increase, or (2) wait until they know what value the yen will finally reach and how long surcharge will remain in effect before negotiating new sales contracts. If they can afford to maintain their stockpiles, then it is possible they will be able to reenter the U.S. market profitably. (U.S. Embassy Report, Tokyo, Oct. 8, 1971, and other sources.)

1/Prior to Aug. 28, 1971, the yen was valued at 360 to the dollar. On Oct. 8, it was trading at 339 to the dollar, or about 6% higher. Combined with 10% surcharge, the net effect is a 16% upward valuation on all Japanese exports of canned fishery products to the U.S.

JAPAN

FISHERY EXPORTS ARE AT VIRTUAL STANDSTILL

Japanese fishery exports, which fell abruptly after implementation of the new U.S. economic plan on Aug. 15, 1971, continue sluggish. Except for frozen tuna and canned mackerel, such exports as canned tuna, crab, and salmon have nearly stopped. There is no indication that sales will resume soon.

The prices of frozen-tuna exports to the United States are reported up 7-8% from earlier levels. In most cases, this has made up for price differences resulting from "devaluation" of the US dollar.

In mid-October 1971, price quotations for Atlantic-caught, frozen, round albacore exports to the U.S. were US$685-690 a short ton, f.o.b. Las Palmas. This is about $40-50 a ton above early-August prices. The Atlantic-caught, gilled-and-gutted yellowfin were being sold to Puerto Rican packers at about $630 a short ton, f.o.b. Las Palmas, up about $50, and nearly the same as yellowfin exports to Italy (around c.i.f. $790 a metric ton, including 3% broker commission).

U.S. Packers' Role

The rise in export prices was attributed primarily to active buying by U.S. packers with ties to major Japanese trading firms. The latter have witnessed sharp drops in canned-tuna supply for sales to the U.S. because shipments of decomposed tuna were detained. These firms are turning more and more to U.S. packers for the supply; at the same time, they are actively offering to sell tuna to those packers.

Canned-tuna-in-brine exports to the U.S. have been at a standstill since the Tokyo Canned Tuna Sales Co. suspended sales to trading firms following imposition of the U.S. surcharge. Canned-tuna-in-oil exports to Europe also are sluggish, but new sales of "dressing" canned tuna have been contracted with several European countries. ('Suisan Tsushin', Oct. 14.)

* * *

JAPAN SKIPJACK FISHERY IS GAINING INTEREST

The fishing industry is showing more interest in the pole-and-line skipjack fishery. Skipjack-fishery operators in northeastern Honshu are building new vessels; longliner owners are considering switching to pole fishing for skipjack. Major firms also are entering the overseas skipjack fishery. Recent surveys and fishing-ground development cruises indicate that skipjack is very promising, particularly when competing tuna species are declining. Adding to fishery's attractiveness are the development of mechanical poling devices to reduce manpower aboard vessels and sharply rising prices.

Year-Round Fishing Vessels

New skipjack vessels and those being built in northern fishing ports are larger--ranging from 192 to 284 gross tons. They are intended for trips of around 30 days, but no longer than 40, because of fuel and bait considerations. They will be used for year-round fishing off northeastern Japan and in the southern areas extending to the Territory of the Pacific Islands. ('Suisan Keizai Shimbun', Sept. 22.)

* * *

NO MERCURY-PRODUCED NERVOUS DISORDERS FOUND IN FISHERMEN

In early July 1971, newspapers reported that scientists had discovered an average of 20 parts per million (ppm) of mercury in a group of 99 fishermen. Old fishermen had the highest level: their hair contained 67 ppm of mercury, and 67 of methyl mercury.

Health Ministry Checks Fishermen

The Japanese Ministry of Health and Welfare intensively checked the health of fishermen who had eaten tuna daily aboard vessels, and whose hair showed a level of over 60 ppm of mercury. The Ministry found no symptoms of nervous disorders associated with mercury poisoning. ('Suisan Tsushin', Sept. 8.)

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JAPAN (Contd.):

VOLUNTARY REGULATIONS FOR SOUTHERN BLUEFIN TUNA IN EFFECT

On Sept. 30, 1971, the Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN) announced that its voluntary regulatory measures to protect the southern bluefin tuna resource would be implemented from Oct. 1, 1971.

The measures provide for closure of the fishery to longline and handline fishing among member vessels in the area of the Great Australian Bight from Oct. 1 to March 31; in the Indian Ocean west of Australia from Dec. 1 to March 31; in Tasman Sea south of Sydney from May 1 to July 31; and off South Africa from Oct. 1 to Jan. 31.

Voluntary Cooperative Venture

Compliance with the regulatory measures will be based on mutual trust and exchange of communication among fishermen. When necessary, the assistance and cooperation of organizations will be solicited. (From W. L. Klawe, Inter-American Tropical Tuna Commission. Also, article in 'Foreign Fishery Information Release', No. 71-14, May 21, 1971.)

* * *

TRAWLERS FISH HERRING OFF U.S. EAST COAST

Six 2,500-gross-ton Nihon Suisan stern trawlers are fishing for herring in the western Atlantic off New York. In mid-September, they were landing 40 tons per day per vessel. The catches were around 80% spawn-bearing herring, of which about 70% were in ripe condition. The herring off the U.S. East Coast is drawing Japanese attention. In Japan, the fish is in short supply because of poor 1971 fishing in the North Pacific, and the ban imposed on egg-bearing herring in the Okhotsk Sea at this year's annual meeting of the Japan-USSR Fisheries Commission.

Help From W. Germany

To master technique of midwater trawling for herring and other species in the North Pacific, where Japanese have not been very successful, Nihon Suisan sent a trawl-gear specialist to West Germany. He is observing trawl operations aboard a large German stern trawler. ('Minato Shimbun', Sept. 12 & 21.)

* * *

SAURY FISHING IS POOR IN NORTHEASTERN PACIFIC

Japanese saury vessels fishing off the U.S. West Coast and off Vancouver, Canada, began increasing this summer. In early September, about 10 vessels were operating there. The majority were fishing east of 125° W. longitude, between 37° N. and 47° N. latitudes. Because of rough weather and high sea-water temperatures of 17°-18°C., saury concentrations were difficult to locate. No vessels had made a good catch. The fish were small: 22-23 cm (8.7-9 inches), which have very little market value.

Hope for Improvement

The outlook was uncertain. But the owners were hoping for an improvement from late September until November, when the season peaks. In late August 1970, 15 saury vessels were fishing off U.S. West Coast. For about a week, they had good fishing, averaging around 5 tons per vessel per day. ('Suisancho Nippo', Sept. 20; 'Suisan Tsushin', Sept. 9.)

* * *

SQUID FISHING OFF CALIFORNIA IS DISAPPOINTING

The 'Ryoun Maru' (300 gross tons), which departed Japan August 11 on a squid exploratory cruise to the eastern Pacific off California, experienced poor fishing. In early September, the vessel caught only 180 kilograms (396 pounds) of squid in one night's fishing. That was her only squid catch. ('Shin Suisan Shimbun Sokuho', Sept. 11.)

* * *

STUDY WAYS TO GET BAITFISH FOR SKIPJACK FISHERY

In late August, NIKKATSUREN investigated the availability of S. Korean baitfish for the Japanese skipjack fishery. NIKKATSUREN is the Federation of Japan Tuna Fisheries Cooperatives Associations. The study revealed that anchovy--mainstay of the fishery in Chinhai Bay, south of Pusan--could be used as bait fish. The problem is how to

JAPAN (Contd.):

transport the live fish to Japan, and then to the southern fishing grounds. Because of the long distance and the sudden warming of tropical water, heavy die-off occurs. Sometimes, all of the live bait is lost.

In mid-September, NIKKATSUREN scheduled sending a baitfish survey team to Taiwan. Unlike S. Korea, Taiwan has dealers specializing in baitfish supply. ('Suisan Tsushin', Sept. 9 & 11.)

* * *

PURSE SEINER REPORTS GOOD FISHING OFF WEST AFRICA

The 999-gross-ton purse seiner 'Nippon Maru' (Overseas Purse Seine Fishing Co.), which began fishing off west Africa in early August, is having more luck. On Sept. 17, the vessel caught 50 tons of yellowfin near 10° S. latitude and 12° W. longitude (off Luanda, Angola).

The vessel is scheduled to operate in that region until the end of November. Then it will undergo servicing before entry into the eastern Pacific yellowfin fishery on Jan. 1, 1972. ('Katsuo-maguro Tsushin', Sept. 22; 'Suisancho Nippo', Sept. 13.)

* * *

RESEARCH VESSEL LEAVES FOR EASTERN ATLANTIC SURVEY

The Fisheries Agency's 'Kaiyo Maru' (2,539 gross tons) departed Japan Oct. 12, 1971, on a 5-month resource-survey cruise to the eastern Atlantic. She will trawl off west Africa and conduct mesh-size-selection study on bottomfish resources such as sea bream, cuttlefish, squid, and octopus.

The codends will have mesh sizes of 50, 70, 90, and 110 millimeters. The trawl-caught fish will be tagged and released to study their distribution and migration.

Two Women Aboard

Two female kitchen workers are aboard. This is the first time women have been employed aboard a government vessel. It is attracting attention because it may suggest a way to relieve the shortage of male workers for sea duty and to "create harmony within the vessel."

Port Calls

The 'Kaiyo Maru' is scheduled to call at Singapore, Durban (South Africa), Dakar (Senegal), Nouadhibou (Mauritania), Las Palmas (Canary Island), Balboa (Panama), and Honolulu. Return to Tokyo is scheduled for Feb. 22, 1972. ('Nihon Suisan Shimbun', Oct. 8; 'Suisancho Nippo', Oct. 13.)

* * *

JAPANESE AND NEW ZEALAND FIRMS SHARE SURIMI VENTURE

Wonder Foods of New Zealand and two Japanese firms (Hokuyo Suisan and C. Itoh) have established a joint surimi (minced fish meat) venture in Nelson, New Zealand. The plant is using imported Japanese machinery. It is expected to process 400 metric tons of surimi during the first year, mostly for export to Japan.

Wonder Foods' fleet will catch the fish; 2 Japanese technicians, based in Nelson, will assist in processing it. Wonder Foods put up 50% of NZ$100,000 investment. (NZ$1.00 equals US$0.85.) Hokuyo Suisan contributed 35%; C. Itoh the remainder.

The firm hopes to try squid fishing later. ('Commercial Fishing', New Zealand.)

NORWAY's FISHING INDUSTRY

A new publication of the Royal Ministry of Foreign Affairs--"The Fishing Industry in Norway," by Håvard Angerman--provides a sharp picture of the world's sixth largest fishing nation.

The fisheries employ directly about 4% of the total work force. This percentage is considerably higher in the coastal districts and especially in the northernmost counties. There, and in Trondelag and West Norway, fishing is "the only economic basis for the maintenance of the population."

Norway is self-sufficient in fish. However, she does import modest amounts of raw materials for processing and reexport.

Norway has 2,175 miles of coastline. If fjords and other inlets are added, the figure becomes 12,420 miles. There are many deep fjords and 50,000 islands and skerries (rocky isles, reefs). A continuous belt of banks borders the entire coast.

Fish are abundant off Norway because the Gulf Stream's warm waters create favorable spawning and growth conditions. Although seasonal fisheries are predominant, much fishing also is done in more distant waters.

Annual catches of 2.6 to 3 million tons landed fish have been made in recent years. The main species are herring, mackerel, capelin, and cod. Coastal fisheries accounted for 57% of total catch in 1969; deep-sea fishing for 43%. The main catch off South Norway is herring and mackerel; off North Norway, the bulk is the cod family (cod, haddock, saithe), capelin, and herring.

Overfishing is endangering fish stocks, especially cod, haddock, herring, and mackerel. Norway imposes strict limits on the amounts of fish her own fishermen can catch.

Small Fishing Boats

The fishing fleet traditionally has been made up mostly of small boats. After 1945, however, the number of larger vessels has increased considerably. Concurrently, the number of fishermen has dropped.

For Fish Meal & Oil

Most fish is used to produce fish meal and fish oil. In 1969, 72% of the total catch went to meal and oil plants. The plants of the freezing industry are strung along Norway's entire coast. The industry and the plants' productive capacity have increased appreciably in recent years. The canning industry has been modernized.

Fishery Product Exports

Norway's main fishery export items are frozen fish, fish meal, klipfish, stockfish, and canned products. The value of frozen-fish-fillet exports soared from N. Kr. 71 million in 1960 to N. Kr. 392 million in 1969 (7.14 kroner to US$).

Exports of fishery products are 15% of Norway's total exports, a major factor in the economy. The economic and social importance of fish has inspired the development of efficient administration in the fisheries. Research wins increasing attention.

Cooperatives

Fishermen's cooperatives are an important part of the industry. The law specifies that all first-hand sales of fish must be handled by cooperative sales groups. Also well organized are marketing and distribution channels.

There have been considerable ups and downs in the amounts of different fish landed in recent years. The main fluctuations have been in catches of herring, capelin, and mackerel. In 1968, these 3 totaled 2 million tons, 77% of all saltwater fish.

THE SEASONAL FISHERIES

The large and diverse seasonal fishing in coastal waters is the most characteristic feature of Norway's fisheries. These fisheries are created by the drift of fish species to inshore waters looking for food or spawning grounds. Some of the main seasonal fisheries are:

Spawning Cod

As each year begins, the Arctic cod migrates to waters off Norway to spawn. From January to April, these spawning grounds off Northern Norway, and as far south as More county, witness frenzied fishing. The spawning cod favors shoals in certain areas; one of the best known is Lofoten in North Norway.

The catches vary greatly and have been declining since 1945. The high mark since World War II was 1947: 206,000 tons of spawning cod were landed; the worst year was 1965: about 45,000 tons. In 1969, the catch was 91,000 tons; in 1970, 101,000 tons.

Finnmark Young Cod

Each year, the younger Arctic cod migrate from the Arctic Ocean in spring to the inshore waters off Finnmark, the northernmost county. They have not attained spawning age. They migrate for food. The fishing season starts in March-April, about the time fishing for spawning cod further south is ending.

Catches of spring cod are much lower than those of spawning cod, still this cod is a major seasonal fishery. It is very important economically to Finnmark. After 1945, it peaked in 1958 at 69,000 tons. After that, it was about 40,000 tons a year; in 1970, 49,000 tons.

Capelin

In spring too, and in the same waters as spring cod fisheries, a third fishery starts--for capelin. This is a small fish sought by the spring cod in its food migration.

Capelin produces fish oil and meal. Very large amounts can be caught. In 1970, capelin was the largest fishery. Catches vary sharply: in 1962, 363 tons; in 1964, 19,626; in 1965, 217,000 tons; in 1969, 679,000 tons; in 1970, a new peak of about 1.3 million tons.

Winter Herring

As spawning cod season begins in North Norway, the herring fisheries begin in more southerly coastal waters. In February-March, the mature group of Atlanto-Scandian herring stock migrates to Norwegian coastal waters to spawn. Catches fluctuate widely: 1956 set a record of 1,146,000 tons; 1963, 62,000 tons; 1966, 461,000 tons. In 1969, it dropped disastrously to 15,000 tons--poorest in about 90 years.

Mackerel

From April-May to autumn, mackerel is fished off Norwegian part of Skagerack coast and western shores of South Norway. Years ago, all mackerel was human food, 15-20,000 tons a year. In mid-1960s, ring net and power block were introduced. Catches increased substantially. In 1967, a peak of 868,000 tons landed was reached; in 1969, 683,000 tons. Only a small part of these larger catches has gone for more food for people. The great bulk is raw material for oil and meal factories.

Coastal & Deep-Sea Fisheries

During the 1960s, there was a trend toward equality in the relative importance of coastal and deep-sea fisheries. In 1962, coastal and inshore banks provided 74% of the total catch; distant or deep sea, 26%. In 1969, the former was 57%, the latter 43%.

Starting in 1965, with the greater use of purse-seines with power blocks, distant-water catches increased sharply--mainly from North Sea's herring and mackerel fisheries.

"Due to overfishing and depletion of stocks, however, catches in the North Sea would seem likely to decline, in which case the coastal fisheries will regain their dominant position."

Regional Distribution of Landings

South Norway traditionally has yielded more fish than North Norway. It was due to the rich herring fisheries off South and West Norway. Later, it was logical to land in South Norway the North Sea herring and mackerel catches. Beginning in 1968, however, these catches declined, while capelin developed into No. 1 raw material for herring oil and herring meal production.

Winter and summer fishing for capelin is mainly off Finnmark, so supply to herring meal and oil plants in North Norway has improved appreciably. This has contributed to balancing the distribution of landings. In 1968, 1.6 millions tons of fish were landed in South Norway; in North, 1 million.

Stocks of Fish

There are very sharp short- and long-term changes in the rich seasonal fisheries in coastal waters. So catches fluctuate greatly. The heavy exploitation of fish stocks has had a major effect on the amount of catches in recent years. The yields give "disturbing evidence" that several species are "in danger of being overexploited." Herring and mackerel are two. And there is overfishing of cod and haddock, international investigations show.

There is a growing desire for international protection of the fish stocks of the northern Atlantic. The International Commission for the Northwest Atlantic Fisheries (ICNAF) and the Northeast Atlantic Fisheries Commission (NEAFC) have agreed on minimum measurements for the mesh of trawling nets and minimum fish sizes. In NEAFC area, international inspection began Jan. 1, 1970, to check these regulations.

Anticipating international regulations to further control intensive fishing, Norway introduced catch restrictions in 1970. These apply to her fishermen in small-herring and mackerel fisheries and, partly, to capelin.

The Fishing Fleet

The extensive fishing off Norway has influenced greatly the kind of fleet Norway has--many registered small vessels. In 1969, 36,402 vessels (383,559 gross tons) were registered for commercial fishing. Of these, 32,775 were under 40 feet; 27,521 were open boats.

Since 1945, there has been a sharp relative increase in larger vessels. Norway now has a sizable up-to-date fleet of them. This resulted from the expansion of seine-pursers and trawler fleets. Many deep-sea longliners were built.

The Fishermen

Norwegian fishermen have combined fishing with other work, especially farming. Since 1945, the number of commercial fishermen has declined steadily, but the rate has slowed somewhat in recent years. The number that are fishermen-only has remained stable; those for whom it is primary job have declined sharply.

In 1969, Norway had 47,779 commercial fishermen: the only occupation of 48% (22,912) was fishing; 52% (24,867) were about evenly divided between those listing fishing as main or secondary occupation.

Following 1945, there was a "disturbing development in the age composition of Norwegian fishermen." Ever-fewer youths chose to be fishermen. There are some recent signs of a better balance in recruitment to the industry, though the number of older fishermen still seems to be increasing. The improvement resulted mainly from the introduction of large modern vessels and the chances of earning more money.

In 1966, 41% of the fishermen were 50 or over; 31% of all fishermen-only were over 50; in fishing as primary occupation, 45% were over 50; in group fishing as a secondary job, those over 50 were 53%.

How Catch Utilized

In 1969, 73% of all fish landed was used as raw material for meal and oil; the remaining 27% went for human consumption. The figures, however, obscure wide differences in the use made of various species.

Salting and drying are most frequently used to preserve fish. These processing forms are vital to Norway's fisheries, especially to areas where much cod and cod species are landed--North Norway and Sunmore county.

In 1969, 208,000 tons of cod were landed: 48% was salted or dried (stockfish), 44% frozen. Only 6-7% was sold fresh.

About 25% of that part of the herring catch consumed as food was salted (as was cod). However, much larger amounts of herring than cod are eaten fresh, frozen, or canned. In 1969, catches of herring and brisling (sprat) were 204,630 tons; 24.2% consumed fresh; 11.6% converted into frozen products; 24.3% salted; and 39.9% went to canning factories.

Fish Products Industry

The great variety of fish off long coast explain the existence of many processing plants. Salting, drying, and freezing plants are mainly in the north, from Möre county northward. Canning, fishmeal plants, and oil plants are mostly south of Möre.

Since 1945, the composition of fish-processing plants has changed greatly. The major development has been expansion of the freezing industry along the entire coast. Plants for conventional drying and salting of fish have declined.

Since 1960, the number of meal and oil plants has remained constant. Although new plants were built, older units dropped out. Productive capacity has increased. The development of year-round fishing for herring, mackerel, capelin, and other species has led to continuous operation of the fish-processing plants.

Herring processing has been concentrated into fewer plants. New methods have been introduced into freezing of herring.

In recent years, the number of canning factories has fallen. Canning is being concentrated in selected central locations. This development, plus quick-freezing of fish for later processing, has enabled plants to move toward continuous operation. New and larger plants use up-to-date equipment.

EXPORTS

About 15% of the value of all exports is fish and fish products:

Norwegian Exports, Mill. N.Kr. (7.14 Kr. to US$)

	1965	1966	1967	1968	1969
Total Value All Exports	9,403	10,321	10,889	11,876	13,422
Value of Fish & Fish-Product Exports	1,434	1,544	1,727	1,533	1,786
Percent	14.2	15.0	15.9	12.9	13.3

In 1967, exports of meal and oil products were 42% of value of exported fish products. Klipfish and dried fish hold predominant positions.

Exports of frozen fillets have developed rapidly in volume and importance. In 1960, these totaled 26,110 tons, f.o.b. value of N. Kr. 71 million; by 1970, 125,000 tons with export value of N. Kr. 459 million.

The U. S. is an important buyer of canned products and frozen fillets. The United Kingdom takes mainly frozen fillets and fish meal. Sweden is an important customer. Other countries import mainly frozen products, dried fish, klipfish, and meal.

IMPORTS

Norway is "essentially self-sufficient" in fish and fish products. Imports are not restricted. So there always will be some raw materials imported for the fish-processing industry, especially klipfish and canning industry, and fish for direct human consumption. Most food-fish imports go to southeastern Norway, especially Oslo area.

Foreign fishing vessels cannot land fish without a special permit from Ministry of Fisheries.

In 1969, Norway imported fish and fish products worth N. Kr. 46 million; one third were raw materials to be processed for reexport. Imported fish for humans was only $1\frac{1}{2}$-2% of exports of fish and fish products.

Quality Control

Norway has long maintained high standards of quality control. These controls cover all species of fish and all products made from fish landed and processed in Norway for export or for domestic use.

Technical Training

There is a comprehensive technical training program for fishermen and fish processors. Five State-established fisheries colleges are distributed centrally. Here, men 17 to 30, with some commercial fishing experience, can receive more training. Students at these colleges have finished compulsory 9-year basic schooling. There are 3 programs: for skippers of fishing vessels, for marine engineers, and for cooks.

Also, a State school trains handlers and processors of fish; another school qualifies engineers for freezing and cooling plants; and a technical institute provides practical and theoretical training in canning fish and other food products.

Short courses concentrate on special fishery problems. In 1969, courses were begun

to qualify technicians and engineers graduated from technical colleges as specialized fisheries technicians and engineers.

Norway now is studying the value of instituting fishery education at the university level.

Marketing

All commercial sales by fishermen must be handled by legally protected sales units. This system, which began in the 1930s, is a monopoly designed to deal with firsthand sales. The cooperatives handle sales of all fish.

The prices fishermen receive are negotiated by their sales organizations, buyers' groups, fish processors, and exporters.

Exports

Exports of fish and fish products are regulated. The Ministry of Fisheries authorizes 15 special export committees to grant licenses. Each committee deals with a specific fish product. A committee includes representatives of the national exporter associations.

INDUSTRY's ECONOMIC IMPORTANCE

Per-capita consumption is estimated at about 40 kilos (90 lbs) per person per year.

In 1969, investments in fisheries totaled N. Kr. 431 million--about 1.8% of gross fixed capital in Norway that year. Domestic fishery products were worth 928 million--1.2% of gross domestic product.

Fishery employment is 4% of total employment, but the percentage is much higher in northernmost counties. In Finnmark, for example, about 24,000 people, one third the area's population, earn their living completely or partly from fisheries or related activities. They are important consumers of the area's farm produce and other goods and services. "The fisheries, directly and indirectly, provide the basis for employment and means of livelihood of more than half of the population of the county of Finnmark."

In the coastal regions, fishing is the mainstay of the population. It is often combined with other occupations, especially farming, to provide an adequate income. "There will in the foreseeable future continue to be great need of fishermen who can combine fishing with another occupation."

Income studies show that many fishermen earn less than they would in many fixed-salary jobs they could hold on land.

The report of the Royal Ministry of Foreign Affairs concludes: "These conditions along with the hard physical life which fishermen have to support, is causing a flight from the fisheries, in Norway, as in other fishing nations. The fisheries are however so important for the economy of the country that the authorities are taking action to make conditions as attractive as possible."

SOVIET DEMANDS EARLY HALT IN LAKE BAIKAL POLLUTION

Theodore Shabad

MOSCOW, Sept. 24--The Soviet leadership, displaying a renewed sense of urgency over the pollution issue, called today for prompt measures to protect the environment of Lake Baikal, the world's largest fresh water lake.

A decree by the Communist party's Central Committee and the Government, published in major newspapers, ordered new deadlines for the installation of improved treatment devices to purify wastes discharged by two pulp mills on the lake's picturesque shores.

The order, following up on a directive in February, 1969, appeared to reflect official interest in a renewed public discussion of environmental problems, which were muted in the controlled press for some time.

After several years of open debate, publication of articles exposing environmental pollution was apparently ordered suspended a year ago. Soviet ideologists were reported to be annoyed by the suggestion that Communist and capitalist societies faced similar environmental problems.

Judging from the renewed emphasis, the ban was apparently lifted some months ago. Now scarcely a day goes by without news articles about pollution and what is being done about it.

The tone of the decree on the Lake Baikal issue suggested some impatience over the

fact that the 1969 directive had not yet been implemented. That order, issued only by the Government, declared the area a protected zone in which timber cutting and other industrial operations were to be strictly regulated.

The new order, which carried the additional weight of a party directive, called on Government agencies and the Academy of Sciences to "speed the drafting of plans for organization of the protected zone and for the rules of conservation of the waters of Lake Baikal and the natural resources of the lake's drainage basin."

The Baikalsk pulp mill, whose discharge of untreated wastes had stirred an outcry

Reprinted from The New York Times, Sept. 25, 1971.

among conservationists, was ordered to complete waste-treatment facilities by the end of the year. A previous order, to finish the job by the end of 1969, evidently went unheeded.

The decree did not mention a more expensive project that would have diverted the mill wastes into a neighboring valley. That project had been urged by scientists on the ground that no existing waste-treatment system was adequate to protect the unusual purity of the lake and to preserve its distinctive plant and animal life.

A second pulp mill, at nearby Selenginsk, is to be complete next year, but the Ministry of the Pulp and Paper Industry was admonished not to begin operations until "appropriate treatment facilities" are ready. There had been reports that the plant would recycle its waste.

Other industries along the Seenga River, which empties into the lake, were given until the end of 1972 to install waste-treatment devices. The city of Ulan-Ude, with a population of 250,000, was ordered to build a sewage-treatment plant not later than 1973.

The Baikal directive appeared amid articles in the press that suggested growing official concern over pollution. Today, for example, it was reported that 200 factories that polluted the atmosphere had been closed or moved out of Moscow over the last 10 years. Similar actions elsewhere are being publicized.

A high official of the electric power industry said at a news conference today that Soviet electric stations were under rigid regulations to prevent air and water pollution.

The official, Anatoly I. Maksimov, a Deputy Minister of electric power, said plants were prevented from raising the temperature of streams with their waste waters by more than an acceptable standard--about 7 degrees Fahrenheit. He said an effort was being made to halt the discharge of hot water.

SPAIN BUILDS LARGE TUNA SHIPS

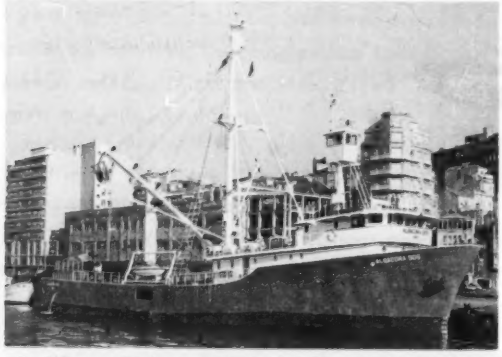
Two of the largest tuna purse-seiners ever built in Europe are nearing completion in Spain for owners in France, reports 'Fishing News International' (Aug. & Oct. 1971). Each ship is 75.5 meters long, has a beam of 13.5 meters, a fish capacity of 2,000 tons, and accommodates 19 men.

The new ships differ from the first U.S.-style super seiner ('Biscaya') introduced by France in 1969: they have double the capacity, and the main engine and auxiliaries are at the stern with 22 wells refrigerated storage running forward from engine room. The compressors are housed in the bow, separating the freezing equipment from engine room.

The ships are being built in Bilbao and Gijon. The French owners are negotiating for a third vessel. Their plans are to supply tuna to the French market, now paying $615 a ton.

Government Aid

For 10 years, until 1970, the Spanish Government made funds available to promote construction of a large, distant-water, freezer-trawler fleet. Spain now has one of Europe's most modern fleets. Government policy is to encourage construction of ships to produce tuna a id more canning plants.



The 'Albacore Dos', one of Spain's latest purse-seining tuna boats.

The tuna fleet has 136 wooden-hulled boats with 18 freezer vessels now operating mainly from Bermeo on the north coast. Recently, the first of three 1000-ton-capacity, steel, tuna purse-seiners was put into operation. There are signs that with the government credit program directed toward tuna-fleet expansion, Spain will move into that fishery with larger vessels. The new vessels are U.S.-style and will fish the West African tuna grounds.

ITALY ANNOUNCES MERCURY-TESTING PROCEDURE

The Italian Government has made public an ordinance relating to mercury testing in fish and processed fish products. Where the shipment consists of different kinds of unpackaged fish, the same kind of fish from each shipment will be considered as one lot; samples representing the lot will be collected from different-sized fish. Tuna and other fish weighing over 10 kilograms (22 pounds) will be sampled as follows:

No of Fish Samples	Weight of Lot Metric Ton
10	Under 50
15	50-100
20	100-200
25	Over 200

For testing purposes, between 50-200 grams of muscle tissues will be extracted from each sample. ('Katsuo-maguro Tsushin', Sept. 21.)

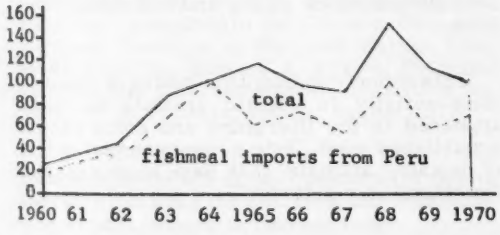
PERU'S FISHERY MISSION TO JAPAN WAS NOT VERY PRODUCTIVE

In April 1971, Peruvian Fisheries Minister Tantalean visited Japan to seek: (1) a $30 million loan, (2) increased purchases of fishmeal, and (3) investments by Japanese in the Peruvian fishing industry. His 17-day mission did not produce any significant changes.

Loan: Japan rejected the request for a loan to improve fishing ports and to develop an inshore fishery.

Fishmeal: On October 1, Japan eliminated its import quota on fishmeal. But, at the same, it imposed a heavy duty (US$55 per ton) on all imports over 56,000 tons for 2nd half of fiscal year 1971. So Japanese fishmeal producers are offered the same protection as the present quota provides. Japanese fishmeal imports from Peru are unlikely to change (see fig.)

Japanese fishmeal imports (1960-1970)
(in 1,000 metric tons)

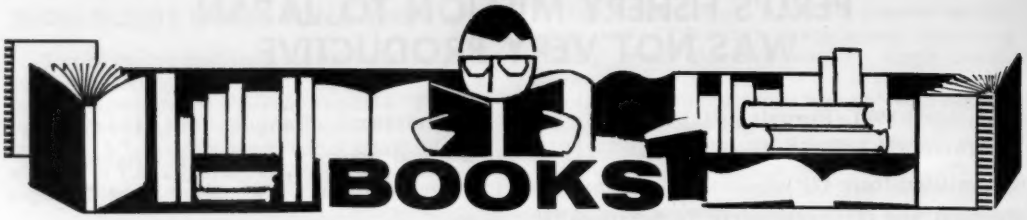


Investments: Tantalean visited many firms and encouraged the establishment of joint ventures in Peru. He had little success.

Only one joint venture may result. Nippon Hogei, owner of firm in Paita, Peru, and Mitsubishi Shoji (trading firm) have started a resource survey off Peru. They are using a 350-GRT trawler and a 350-GRT skipjack-squid vessel. If the results show promise, the firms and Peru will consider a joint venture with each party owning $\frac{1}{3}$ of shares. Tentatively, Peru will provide land at Callao, and the Japanese will construct a $1-million cold-storage facility.

Area of Dispute

Many unsettled problems remain. The Japanese have been antagonized by Peru's seizures of her vessels in Peru's 200-mile territorial sea. Also, the Japanese fear possible nationalization of their operations. Recently, Peru and USSR signed assistance agreement. A large Soviet exploratory stern trawler already is operating off Peru. This has not helped soothe Japanese fears about the political situation. Also, the Japanese are reluctant to borrow money in Peru because of 12% interest rates; and, because of strict exchange laws, they cannot use yen or US dollars. This venture face much negotiation. (U.S. Embassy, Tokyo, Sept. 23.)



The following publications of the Department of Commerce, National Oceanic and Atmospheric Administration, National Marrine Fisheries Service, are available free from Division of Publications, NOAA, Connecticut Ave. & Van Ness St. NW., Bldg. 52, Washington, D.C. 20234.

HERRING

"Age Composition, Weight, Length, and Sex of Herring, Clupea pallasii, Used for Reduction in Alaska, 1929-66," by Gerald M. Reid, SSR-Fisheries No. 634, 25 pp., illus., tables, July 1971.

This report compiles data gathered in years between 1929 and 1966 in Alaska's three major herring fishing areas--southeastern Alaska, Prince William Sound (including Resurrection Bay-Day Harbor), and Kodiak. The data include weight of catches, weight allowed by quota, and age composition, average weight, average length, and sex ratios.

The catch sizes and amount of fishing effort varied greatly within area covered by each district because: (1) herring tended to concentrate in certain areas, (2) regulations restricted the geographic extent and timing of commercial fishing within each district, and (3) fishing tended to be more intense near reduction plants.

The age of herring was determined by counting the annuli on scales. The sampler examined the scales at the sampling site; this was verified later by other persons. Until 1957, low-power microscopes were used; later, microprojectors replaced them.

The average or mean weight for fish in each age class was obtained by summing the weight of individuals and dividing by their number.

The body lengths of herring were measured to posterior end of hypural plate (found by dissection); "the measuring machine was modified from a visual readout to an entirely mechanical readout." The body lengths were recorded to nearest millimeter. To determine average body length of a fish of a certain age, the lengths of all fish that age were summed, then divided by number of fish in age class.

Sex was determined in a sample by visual examination of gonads.

THIAMINASE IN SOME AQUATIC ANIMALS

"Occurrence of Thiaminase in Some Common Aquatic Animals of the United States and Canada," by R. A. Greig and R. H. Gnaedinger, SSR-Fisheries No. 631, 7 pp., tables, July 1971.

If thiaminase is present in fish that are fed raw to animals, it can cause dietary deficiency. The knowledge whether fish do or do not contain thiaminase is important to animal feeders for safety and economic reasons.

This report combines the listing of thiaminase activity in aquatic animals that have appeared in the literature and some recent unpublished work "into a comprehensive list of aquatic animals that have been assayed for thiaminase activity."

The presence or absence of thiaminase in freshwater and marine fish and shellfish is presented in two tables.

The findings are significant: (1) It is possible that some animals listed in the tables were found to contain thiaminase because they were caught at a time when their stomachs

thiaminase-containing food in their stomachs. (2) The findings could help to explain apparent discrepancies that sometimes occur in reported thiaminase activity of certain species.

FUR SEAL

"Fur Seal Investigations, 1969," by Marine Mammal Biological Laboratory, SSR-Fisheries No. 628, 90 pp., charts, illus., tables, August 1971, contains Part I and Part II.

"Part I - Fur Seal Investigations, Pribilof Islands, Alaska, 1969" summarizes fur-seal research on Pribilof Islands, June-October 1969, as part of a program to provide a basis for determining level at which herd will produce maximum sustained yield.

The report contains descriptions of terms having special meanings in fur-seal research, locations of rookeries and hauling grounds on Pribilof Islands, and the 1969 fur-seal researchers.

"Part II - Pelagic Fur Seal Investigations, 1969" were conducted in February and March in the eastern North Pacific Ocean off Washington State. The objective was to collect data that would show changes, if any, in distribution of fur seals by sex, age, and time; also, to obtain current information on pregnancy rates and food habits.

FISHERY SUPPLIES

"Chart Book of U.S. Fishery Supplies, 1969-70," prepared in the Current Economic Analysis Division of National Marine Fisheries Service, Wenona J. Crews, Principal contributor, Current Fishery Statistics No. 5586, 31 pp., charts, tables, August 1971.

This NMFS Division provides background information on which the commercial fishing industry can base its analyses and decisions. The report is part of that service.

This chart book presents a series of data on U.S. production and imports of selected fishery products for 1960-70. The charts are designed to aid in evaluating the relative share of imports in the total U.S. market for fishery products.

Tariff rates on fishery products in existence before Aug. 15, 1971--the date Pres. Nixon's new economic policy was announced--are listed. These will be the rates when the 10% surtax on imports is removed.

The amount of the domestic production exported is shown in some tables and charts.

FISHERY BIOLOGY

"Fishery Bulletin" of the National Oceanic & Atmospheric Administration, National Marine Fisheries Service, Department of Commerce, Vol. 69, No. 3, July 1971, pp. 455-701, illus., contains 18 technical reports on investigations in fishery science.

Bulletins are distributed free to libraries, research institutions, State agencies, and scientists. Some bulletins are sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

"Internal Defenses of Crustacea: A Review," by Carl J. Sindermann, pp. 455-490.

This review discusses some early literature, concepts, terminology, and known diseases of Crustacea. More recent studies "are considered by categories of cellular and humoral systems: phagocytic, bactericidal, lytic, aggulutinating, precipitating, phage clearing, and antitoxic." A section reviews "the demonstrated systems of internal defenses of lobsters and other crustaceans against the microbial pathogen Gaffkya homari. The author considers this" one of the best examples of a test system for invertebrates for which existing information is adequate."

"Cleaning Symbiosis Among California Inshore Fishes," by Edmund S. Hobson, pp. 491-524.

The author describes cleaning symbiosis among inshore fishes of southern California. The work was centered at La Jolla. He attempts to relate observed activity with the incidence of specific ectoparasites. "Three species are habitual cleaners: the senorita, Oxyjulis californica; the sharpnose seaperch, Phanerodon atripes; and the kelp perch,

Brachyistius frenatus. The tendency to clean varies between individuals." He states that the fishes cleaned most often are the most abundant ones; at the same time, these arethe most heavily infested with external parasites.

"Gray Whales, Eschrichtius robustus, Avoid the Underwater Sounds of Killer Whales, Orcinus orca," by William C. Cummins and Paul O. Thompson, pp. 525-530.

The researchers conducted underwater sound playback experiments "to determine if gray whales would avoid the sounds of killer whales." When the underwater projector produced killer-whale "screams," the gray whales swam directly away from the sound source. "Controls of no intended stimulus, pure tones, and random noise generally failed to induce an avoidance." The gray whales appeared to localize killer whale sounds and avoid them as potential danger.

"Killer Whale, Orcinus orca, Sounds Repel White Whales, Delphinapterus leucas," by James F. Fish and John S. Vania, pp. 531-536.

This study was carried out to see if the migration of white whales up the Kvichak River, Bristol Bay, Alaska, could be stopped by aiming high-intensity underwater sounds at them. While in the river, these whales eat salmon smolt migrating down to the sea. The researchers found that transmission of killer-whale sounds barred the whales effectively. During control periods, when the sound was not projected, the whales moved freely in and out of the river. "A permanent playback system could be installed with little difficulty and would result in a significant reduction in the number of smolts consumed by belugas in the Kvichak River."

"Developmental Abnormalities of the Flatfish Achirus lineatus Reared in the Laboratory," by Edward D. Houde, pp. 537-544.

Twenty-six of 31 Achirus lineatus juveniles reared in a single experiment were abnormal. The abnormalities included "incomplete eye migration, hooked dorsal fins, the presence of a left pectoral fin, ambicoloration, and partial albinism." The article contains descriptions and photos of the abnormal specimens. It describes too a single reversed specimen, preserved as a nearly metamorphosed individual. Most abnormal conditions were interrelated. The author discusses the possible effects of the rearing-tank environment on abnormal development.

"The Early Life History of Skipjack Tuna, Katsuwonus pelamis, in the Pacific Ocean," by Howard O. Yoshida, pp. 545-554.

The study "investigates the early life history of skipjack tuna, including the distribution, abundance, age and growth." It is based on 1,742 juvenile skipjack tuna between 1.6 and 40 cm taken from the stomachs of 6,967 billfishes near Hawaii and in the South Pacific. The smallest juvenile taken near Hawaii was 5.9 cm in standard length; in South Pacific, 1.6 cm.

Length-frequency distributions of Hawaiian skipjack tuna showed well-defined modes; these progressed with time. The growth of juveniles was estimated by using the modal lengths determined from monthly length-frequency distributions. Around Hawaii, skipjack tuna between 9 and 40 cm are estimated to grow 2.0 cm per month. One-year-old fish are estimated to be 31 cm. standard length.

"Distribution of Tuna Larvae (Pisces, Scombridae) in the Northwestern Gulf of Guinea and Off Sierra Leone," by William J. Richards and David C. Simmons, pp. 555-568.

Researchers investigated tuna-larvae distributions in northwestern Gulf of Guinea and off Sierra Leone during February-April 1964, August-October 1964, and February-April 1965. Larvae of yellowfin tuna, bigeye tuna, skipjack tuna, little tunny, and frigate mackerels were collected and studied.

The study purposes were to (1) analyze the time collections were made, (2) describe distribution of tuna larvae, and (3) discuss relations of tuna larvae to oceanographic features. Sightings of surface schools of tuna were recorded, and several oceanographic features (temperature, salinity, and dissolved oxygen) were measured.

Data showed larvae of yellowfin tuna and bigeye migrate to surface during day; skipjack migrate to surface during night; frigate

mackerels do not seem to migrate. The little-tunny data were inconclusive.

"Random Variability and Parameter Estimation for the Generalized Production Model," by William W. Fox, Jr., pp. 569-580.

This article discusses the nature of simple random variability and its relation to estimating the parameters of the generalized production model. An illustration of residuals examination in selecting the appropriate statistical model for the parameter-estimating technique of Pella and Tomlinson (1969) is included. The illustration uses data from the fishery for yellowfin tuna, Thummus albacares, in the eastern tropical Pacific Ocean.

"Additional Data on the Spawning of the Hake," by John S. MacGregor, pp. 581-587.

In January 1970, samples of hake were taken off southern and central Baja California to determine if there were geographic differences in hake fecundity in the offshore waters of Baja California. The samples contained prespawning females, from which estimates of fecundity were obtained. The hake from northern Baja California--there are fecundity data on them--appear identical to those off southern and northern California. Those farther south are different in growth rate and size at first maturity; in fact, they have been described as a different species. There is no significant differences in fecundity among the three areas. The hake spawns once a year, over 98% of the spawning between January and April.

"The Low-Temperature Threshold for Pink Salmon Eggs in Relation to a Proposed Hydroelectric Installation," by Jack E. Bailey and Dale R. Evans, pp. 587-594.

This report analyzes the effects of the proposed hydroelectric installation on the temperature regime of Lake Grace and Grace Creek. It describes the threshold temperatures for development of pink salmon embryos. Then it relates the two studies and discusses the implications.

"Primary Production in the Mid-Subarctic Pacific Region, 1966-68," by Jerry D. Larrance, pp. 595-614.

"Primary productivity, chlorophyll a, net zooplankton, nutrients, and associated physical variables were measured on seven cruises in the mid-Subarctic Pacific Region in 1966-68." Most data were collected between lat. 46° N. and central Aleutian Islands; several measurements were made as far south as lat. 40° N.

The objectives of this study were to obtain and estimate annual productivity and to detect differences in productivity levels, if any, among several oceanographic areas identifiable by physical characteristics.

"Iago, A New Genus of Carcharhinid Sharks, with a Redescription of I. omanensis," by Leonard J. V. Compagno and Stewart Springer, pp. 615-626.

"A new genus, Iago, is proposed for Eugaleus omanensis Norman, 1939." I. omanensis was described originally from a single specimen. Now it is redescribed from 16 more specimens from the northern Arabian Sea continental shelf and slope between the Gulf of Oman and the Gulf of Kutch. The authors discuss its presence in areas of low oxygen, and the possibility of its occurrence in deeper waters of the Red Sea.

"Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausiid Shrimp," by James L. Cox, pp. 627-634.

The author reports the results of an experimental study of the euphausiid crustacean Euphausia pacifica dealing with quantitative aspects of DDT acquisition from food and water, rates of loss of acquired DDT, and factors affecting equilibration with surrounding water. He discusses the possible effects of dietary changes, moulting, and surface-to-volume ratios on observed natural levels.

The Euphausia pacifica Hansen, an abundant euphausiid shrimp in California Current, can acquire sufficient DDT residue from its food to account for the amounts found in its tissues.

"A Key to the American Pacific Shrimps of the Genus Trachypenaeus (Decapoda, Penaeidae), with the Description of New Species," by Isabel Perez Farfante, pp. 635-646.

The study of American Pacific members of the genus Trachypenaeus "reveals that variation in armature of the telson includes not only movable spines, but also fixed spines and even no spines at all." It confirms too that the eighth somite bears two arthobranchiae instead of one arthobranchia and one pleurobranchia. The article describes new species, Trachypenaeus fuscina, presents the specific features of T. faoea Loesch and Avila. It includes a key to the 5 members of the genus, and their ranges, in the region.

"Artificial Ripening of Maatjes-Cured Herring with the Aid of Proteolytic Enzyme Preparations," by T. M. Ritskes, pp. 647-654.

The aim of this investigation was "to find the conditions for obtaining an acceptable maatjes-cured herring by the addition of protease preparations." By doing this, a product with the desired organoleptic properties might be manufactured from herring that have relatively inactive appendices pyloricae and so cannot ripen in a natural way.

No significant differences were found between naturally ripened herring and herring cured with the aid of enzyme preparations. The lipase content of the preparation should be low enough to avoid formation of a fatty acid taste in the cured fish.

"Laboratory Studies of Predation by Marine Copepods on Fish Larvae," by Kurt Lillelund, and Reuben Lasker, pp. 655-668.

Various marine copepods have fatally injured or captured and ingested young anchovy larve in the laboratory. "Labidocera jollae, L. trispinosa, and Pontellopsis occidentalis (family Pontellidae), species common to surface waters of the California Current, are effective predators of larval fish. The copepods can be attracted by the vibrations of the larval tail beat and react by biting or capturing the fish larvae."

This study contains results of experiments to measure quantitatively the ability of 3 pontellid marine copepods "to capture or fatally injure larvae of northern anchovy." The behavior of copepods and larvae bearing on the susceptibility of the northern anchovy, Engraulis mordax, to predation is described.

"Trophic Interaction Between the Sea Star Pisaster giganteus and the Gastropod Kelletia kelletii," by Richard J. Rosenthal, pp. 669-680.

"This paper examines laboratory and field data obtained on the behavioral interactions between the sea star Pisaster giganteus and the gastropod Kelletia kelletii. Included are observations on the feeding, species-specific responses, and predator-prey interaction between the two species."

"Variability of Near-Surface Zooplankton Off Southern California, As Shown by Towed-Pump Sampling," by Charles P. O'Connell, pp. 681-698.

The article describes "variations in the density of near-surface populations of small copepods, large copepods, euphausiids, and chaetognaths" for a 6,000-square-mile area off southern California from three cruises in autumn 1961 and two in autumn 1962. The researchers collected samples with a towed pump at a depth of 5 m. On each cruise about 162 samples, each representing a 1-mile transect, were collected.

--Alma Greene

THE ROCKFISH's HOMING ABILITY

Last year, biologists of the NMFS Auke Bay (Alaska) Coastal Fisheries Research Center discovered that yellowtail rockfish, Sebastodes flavidus, have a highly developed homing ability.

In an experiment, 35 fish that had been captive for 3 months were released; within days, they returned 5 miles to their capture site.

1971 Experiment

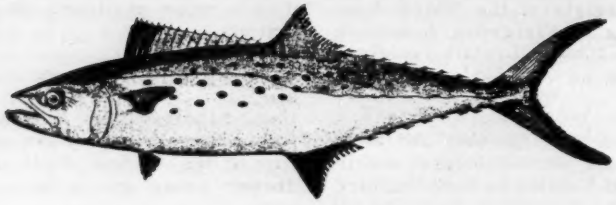
In August 1971, the Center's biologists-divers programmed their monthly proficiency dive to observe the orientational behavior of 2 groups of displaced rockfish. Each 5-fish group was released into waters where the divers were stationed on the 30-foot-deep bottom.

The behavior patterns of both groups were similar. When released, the fish headed toward their capture site, and swam parallel to the shoreline; they maintained this direction at the 30-foot depth until they came to deeper water, where they could not see bottom.

At this point, the fish in both groups began a counterclockwise circling motion which, eventually, took them back to shallower water. There, they resumed swimming toward their "home" site--a sunken passenger liner. The biologists-divers noted that if one fish strayed, it would swim back quickly to within about a foot of another fish.

Winter snows accumulate to great depths at the NMFS Auke Bay Biological Laboratory. (J. M. Olson)

FOOD FISH FACTS



Spanish Mackerel
(Scomberomorus maculatus)

Spanish mackerel are members of a large family of fish that include the tunas and other mackerels. All of these fish, although varying greatly in size, have many common characteristics and all are fast, powerful swimmers. Members of this family live in the open sea and are more or less migratory.

Spanish mackerel are known for their spectacular leaps out of the water. Streaking up from the depths almost like a missile, these fish snatch at bait, climbing as much as 10 feet above the water before arching down and away in a furious struggle. Their spectacular actions and the fight they offer when caught make them particularly desirable to sport fishermen. Their great eating qualities and market demand make them equally desirable to commercial fishermen.

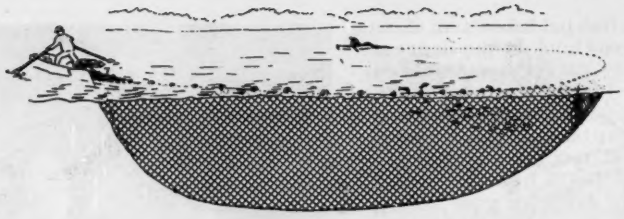
Description

Spanish mackerel are beautifully colored fish. Their slender graceful bodies are dark blue on the upper part, paling until almost silvery on the belly. Many small yellowish or olive oval spots occur above and below the wavy lateral line on the sides and help to distinguish them. Another distinguishing characteristic is the large, sharp, cone-shaped teeth. The two dorsal or top fins are spiny and are hardly separated. The first dorsal fin is long and triangular and the front one-third of this fin is black. The second dorsal fin, which is concave, and the pectoral or side fins are pale yellowish with dusky edges. A number of small finlets occur on the upper and lower body behind the fins and extend almost to the sharply curved tail. The maximum length is around 36 inches. The average fish caught, however, is about 2 to 3 pounds.

Habitat

Spanish mackerel range along both coasts of North America. Along the Atlantic coast they are comparatively abundant from Florida to Chesapeake Bay. They are sometimes found as far north as Monhegan Island, Maine, but are rarely caught north of Cape Cod. Greater abundance is found along the coast of the Gulf of Mexico from Florida to Texas where they enter bays and sounds in large numbers during May and remain through September. On the Pacific coast they range from San Diego, California, to the Galapagos Islands.

(Continued following page)



Runaround Gill Net

Spanish Mackerel Fishing

During the early years of the Spanish mackerel fishery, troll lines, gill nets, and pound nets were used in catching these fish. Today, however, commercial fishermen use gill nets almost exclusively, with a small amount taken by hook and line and troll lines. The sharp teeth of the Spanish mackerel easily cut the mesh when the gill nets were made of cotton twine or linen threads. As a result, maintenance was costly and many fish escaped. Presently the gill nets are made of synthetic materials and range from 400 to 600 yards in length and from 6 to 12 yards deep. Nearly 12 million pounds of Spanish mackerel were caught in 1968.

Management and Conservation

Although it is known that the Spanish mackerel resource is large, it has not been fully utilized. Part of the reason was lack of sufficient information about freezing and storing this species to adequately preserve their delicate flavor. In spite of this, production and distribution of frozen Spanish mackerel had increased dramatically from 156,000 pounds in 1945 to over 3.3 million pounds in 1966. Discoveries made by scientists of the NMFS Technological Laboratory in Pascagoula, Mississippi, have revealed why these fish, when frozen and stored, did not retain the same flavor and had shorter storage life than other species. New treatment methods recently developed at the Laboratory have changed this situation, however, and frozen Spanish mackerel fillets are in much greater demand and are finding wider markets. Service marketing specialists have helped in creating wider demand by introducing this rich Gulf resource to restaurant, institutional, and military feeders.

Uses of Spanish Mackerel

Spanish mackerel are highly nutritious, high in protein, calcium, and phosphorus, and low in sodium and cholesterol. Part of each year's catch is sold fresh, the biggest part of catch, however, is filleted and sold either fresh or frozen. Whole fish and fillets are both popular forms and the Spanish mackerel's high oil content makes them ideal for broiling, baking, or smoking. (National Marketing Services Office, National Marine Fisheries Service, U.S. Department of Commerce, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.)

HOOKED ON FISH? TRY WHITING IN WINE SAUCE

If you are hooked on fish but lukewarm about fishing--you can bait your hook at the nearest seafood market. Many clever homemakers keep their unlucky, would-be fishermen happy in just this way. From cold ocean waters and shallow estuaries to your table is only a short journey with today's fast, modern transportation. Hundreds of varieties of fish and shellfish make the journey daily for your eating enjoyment. Some of these seafoods are considered gourmet and are scarce and expensive. Many more, however, which are equally good to eat, are plentiful and consequently inexpensive. Whiting, among the more plentiful of ocean fish, are in this category.

Have you tried whiting lately? If not, you have a treat waiting for you. These versatile fish, caught along the continental shelf of eastern North America, have tender, lean, firm-textured flesh that is very tasty. Whiting adapt readily to a variety of preparation methods and are ready to thaw and use as they are already scaled, headed, and cleaned.

Whiting In Wine Sauce was created for cooking on an outdoor grill, and its tantalizing aroma as it cooks over the coals as well as its succulent goodness will establish your reputation as a Master Chef. The recipe is so simple and easy--place each fish on a large square of foil, then pour a buttery-wine sauce, accented with mushrooms, green onions, lemon juice, and a touch of crushed bay leaf and thyme, over the fish. Seal the foil packages and cook until the flavors blend and the fish flake easily. Eat this tasty entrée on the patio or tote the makings along in a refrigerated container and cook the fish at your favorite picnic site. If the weather outside is scorching, however, and beating the heat is on your summer agenda, this entrée is equally good when enjoyed inside. Be flexible--there isn't any rule that says all foods cooked out must be eaten out. How about cooking it out and eating it in? You'll keep the cooking heat out, too, and the flavory fish will taste even better in the cool of your home. (National Marketing Services Office, NMFS, NOAA, U.S. Dept. of Commerce, 100 E. Ohio St., Rm. 526, Chicago, Ill. 60611.)

WHITING IN WINE SAUCE
(Cooked On Grill)

- 6 pan-dressed whiting or other small fish, fresh or frozen
- Heavy-duty (18-inch) aluminum foil
- 1 cup dry white wine
- ½ cup melted butter or margarine (or cooking oil)
- 1 can (4 ounces) mushroom stems and pieces, drained
- ¼ cup thinly sliced green onions
- 2 tablespoons lemon juice
- 2 tablespoons chopped parsley
- 2 teaspoons salt
- ¼ teaspoon crushed bay leaf
- ¼ teaspoon pepper
- ¼ teaspoon leaf thyme

Thaw frozen fish. Clean, wash, and dry fish. Cut six 18-inch squares of heavy-duty foil; grease lightly. Combine remaining ingredients; mix and reserve. Place a fish on ½ of each square of foil. Lift edges slightly to keep sauce from running off. Pour ¼ cup of reserved sauce over each fish and seal edges by making tight double folds on all cut edges. Arrange packages on barbecue grill about 6 inches from moderately hot coals. Cook 20 to 25 minutes or until fish flakes easily when tested with a fork. To serve, cut a big crisscross in top of each package and fold foil back. Makes 6 servings.

FOOD FISH FACTS

King Crab

(Paralithodes camtschatica)

King crabs, one of Alaska's most valuable resources, are tremendous fellows. Although the average size is around 11 pounds, fishermen have taken king crabs with a tip-to-tip span of almost six feet and weighing up to 24 pounds.

The scientific name of the king crab aptly describes its appearance. Taken from the Greek, para means closely resembling, lithodes means stone, and refers to its heavy, rough shell which closely resembles a stone. Camtschatica is taken from the Kamchatka Peninsula which extends into the Bering Sea where many king crabs are found.

Description

All crabs have a hard shell and five pairs of jointed legs. The first pair of legs is always equipped with pincers. The hard shell, or exoskeleton, limits the size of the crab and, in order to grow, it periodicaliy sheds the hard outer covering after forming a new, soft exoskeleton. This process is called molting. In the soft-shell stage, crabs are particularly vulnerable to attack from natural enemies and from other crabs. The length of time between molts and the number of times that a crab molts varies with the species and is also affected by temperature, available food supply, and maximum growth.

Another interesting fact about crabs is their ability to drop an injured leg and replace it by growing a new one. This regeneration process is called autotomy and can be continued until the crab no longer molts. The crab, through a reflex action, severs the leg at a preformed breakage point. In this way, the leg is dropped at a point where the possibilities for healing and regrowth are greatest. This process also allows the crab to escape when grasped by an enemy.

In most crabs the first pair of legs are the biggest and the pincers are large. In king crabs the second, third, and fourth pairs of legs are larger than the first pair. At first glance, king crabs may appear to have only four pairs of legs. There is a fifth pair, however, small, bent upward, and often inserted under the shell. These differences, along with the rough, heavy shell and the large size, are some of the distinctive features of the king crab family.

(Continued following page)

Habitat

King crabs are characteristically found in cold waters toward the poles and in the deep sea. Their home is the North Pacific Ocean, the Bering Sea, and the Okhotsk Sea. In some areas, the waters are below 0° centigrade and frequently covered with ice. During the first two to three years of life king crabs live in shallow waters close to shore and congregate in schools or "pods." As they grow older, the annual adult migration begins. King crabs move inshore in winter and early spring to relatively shallow waters, 60 to 200 feet deep, for molting and spawning. In summer and fall, the migration is reversed to deep offshore feeding areas sometimes up to 1,000 feet in depth.

King Crab Fishing

King crabs in Alaskan waters are caught almost entirely by the use of pots. The crab pot, baited with fish or clams, has a tunnel-like opening leading inside. Some of the pots are circular, but the usual type is rectangular and built on a metal frame measuring 7 feet by 7 feet by $2\frac{1}{2}$ feet. These large pots, enclosed with stainless steel wire or nylon webbing, are lowered from the sides of fishing vessels to an ocean depth of around 300 feet. Female and small male crabs are returned to the sea for conservation purposes and only the large male crabs are kept. The crabs retained are kept alive and healthy in a "live" tank of circulating water until ready for the processing plant. Floating as well as shore-based canneries and processing plants receive the crabs from the fishing vessels. The crabmeat is processed quickly and either frozen or canned and transported to home ports aboard the processing vessels.

The peak in the Alaskan king crab fishery was reached in 1966 with a total catch of 159.2 million pounds. The catch of this valuable resource has declined since 1966 and extensive studies are being made by the U.S. Dept. of Commerce's NMFS and Alaskan scientists to determine the cause. The Alaskan Board of Fish and Game, in the meantime, has established new and tighter controls regulating king crab fishing in waters off Alaska.

Uses of King Crab

Although king crabmeat has a flavor, color, and texture all its own, it may be used interchangeably with other crabmeat in most recipes. The prime meat of the king crab is in the claws, legs, and shoulders and this is the part that is used. These parts are separated, washed, cooked in boiling water, chilled, and washed again before being trimmed, processed, inspected, packaged, and quick frozen, ready for marketing. King crabmeat is in two forms--meat and in the shell and is available either fresh packed or frozen. It is also canned, usually in 5, $6\frac{1}{2}$, and 13 ounce sizes for consumer use. (National Marketing Services Office, NMFS, U.S. Dept. of Commerce, 100 East Ohio St., Rm. 526, Chicago, Illinois 60611.)

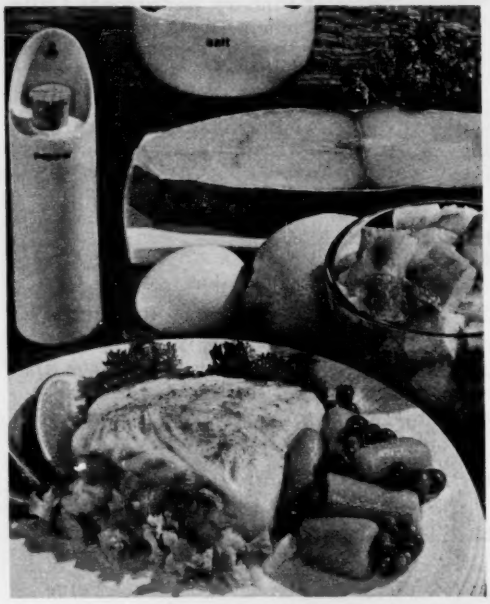
CRAB-STUFFED HALIBUT--A SEAFOOD SPECTACULAR

Company's coming, and you're wondering what to serve? Why not win the accolades of your guests with a seafood spectacular? Halibut, the king of flatfishes, fresh and tasty from the cold waters of the North Pacific, is a fish for all seasons.

Halibut adapts easily to many preparation methods, but it becomes a gourmet entree when stuffed with crabmeat. Crab-Stuffed Halibut, a National Marine Fisheries Service recipe, sounds complicated but is really elegance with ease. The easily prepared crab stuffing, highlighted with the perky flavors of onion, celery, parsley, and a tang of lemon, fits into pockets cut into the halibut steaks. This seafood duo takes about 25 minutes baking time and it's ready to serve--flaky, tender, and aromatic. Be sure to have seconds ready, as this netful of seafood treasure will catch your guests--hook, and sinker. Crab-Stuffed Halibut tastes as good as it looks.

North Pacific halibut is usually sold as steaks, either fresh or frozen. One pound will make two or three servings. An excellent source of high-quality protein and minerals, halibut is low in sodium, fat, and calories. The white, tender, mild-flavored flesh has made halibut highly prized for centuries.

Crabmeat, one of America's choicest seafood treats, is available across the country in one of the following market forms: live; cooked in the shell; cooked meat, fresh or frozen; canned; or pasteurized. The four principal kinds of crab are the blue crab, king crab, rock crab, and Dungeness crab which is currently in good supply. All crabmeat is high in nutrient values and can be used interchangeably in canapes, appetizers, dips, sauces, cocktails, salads, chowders, or a wide variety of entrees.



CRAB-STUFFED HALIBUT

2 pounds halibut steaks or other fish steaks, fresh or frozen
2 tablespoons melted butter or margarine
Crab Stuffing
Lemon wedges

Thaw frozen steaks. Remove skin and bones from steaks. Cut steaks into 6 portions. Cut a pocket in the side of each piece of fish. Divide stuffing into 6 portions, about 2½ tablespoons each. Fill pockets with stuffing. Place stuffed fish in a well-greased baking dish, 13 by 9 by 2 inches. Brush fish with melted butter. Bake in a moderate oven, 350° F., for 20 to 25 minutes or until fish flake easily when tested with a fork. Serve with lemon wedges. Makes 6 servings.

CRAB STUFFING

½ pound crabmeat, fresh, frozen or pasteurized or
1 can (6½ or 7½ ounces) crabmeat
1 tablespoon minced celery
1 tablespoon minced onion
1 tablespoon butter or margarine, melted
1 tablespoon minced parsley
1 egg, beaten
2 tablespoons cracker meal
2 teaspoons lemon juice
¼ teaspoon salt
Dash white pepper

Thaw frozen crabmeat. Drain crabmeat. Remove shell or any remaining cartilage. Cook celery and onion in butter until tender. Combine all ingredients. Makes approximately 1 cup stuffing.

(National Marketing Services Office, NMFS, U.S. Dept. of Commerce, 100 East Ohio St., Rm. 526, Chicago, Illionis 60611.)

INDEX

Page

ARTICLES

1 . . Underwater Fishery Studies Are Valuable, by William L. High

7 . . Seasonal and Geographic Characteristics of Fishery Resources: California Current Region--VII. Pacific Sardine, by David Kramer and Paul E. Smith

13 . . Pond-Raised Channel Catfish: The Design of Boom-Mounted Brailers to Move Them, by Donald C. Greenland, Earnest T. Carlton, Robert L. Gill, and Sammie L. Weaver

UNITED STATES

19 . . Fishery Products Situation, by Donald R. Whitaker

20 . . Alaska's Vast Fishery Resources Present Challenges

21 . . Alaska's Tanner Crab Landings Rise But Market Is Poor

21 . . Kodiak Harbor Pollution Attracts EPA

22 . . First U.S. Survey of Industrial-Wastewater Discharges Begins

22 . . Great Lakes Will Have A Second Icebreaker This Winter

23 . . Porpoises Saved from Tuna Seine by Underwater Sounds

25 . . Blue Fish Attack Yellowtail Flounder

INTERNATIONAL

26 . . Soviet Whalers Sail Before Observer Plan Is Ready

26 . . U.S. and Poland Extend Fishery Agreement

Asia:

Japan:

27 . . Japan Evaluates Effects of U.S. 10% Surcharge

28 . . Fishery Exports Are at Virtual Standstill

28 . . Japan Skipjack Fishery Is Gaining Interest

28 . . No Mercury-Produced Nervous Disorders Found in Fishermen

Page

INTERNATIONAL (Contd.):

Asia (Contd.):

Japan (Contd.):

29 . . Voluntary Regulations for Southern Bluefin Tuna in Effect

29 . . Trawlers Fish Herring Off U.S. East Coast

29 . . Saury Fishing Is Poor in Northeastern Pacific

29 . . Squid Fishing Off California Is Disappointing

29 . . Study Ways to Get Baitfish for Skipjack Fishery

30 . . Purse Seiner Reports Good Fishing Off West Africa

30 . . Research Vessel Leaves for Eastern Atlantic Survey

30 . . Japanese and New Zealand Firms Share Surimi Venture

Europe:

Norway:

31 . . Norway's Fishing Industry

USSR:

36 . . Soviet Demands Early Halt in Lake Baikal Pollution

Spain:

38 . . Spain Builds Large Tuna Ships

Italy:

38 . . Italy Announces Mercury-Testing Procedure

Latin America:

Peru:

39 . . Peru's Fishery Mission to Japan Was Not Very Productive

40 . .BOOKS

45 . .The Rockfish's Homing Ability

46 . .Food Fish Facts (Spanish Mackerel)

48 . .Hooked on Fish? Try Whiting in Wine Sauce

49 . .Food Fish Facts (King Crab)

51 . .Crab-Stuffed Halibut--A Seafood Spectacular

52 . .INDEX

BACK COVER: New Bedford (Mass.) Trawler
in Winter Storm--Vineyard Sound.
(Robert K. Brigham)

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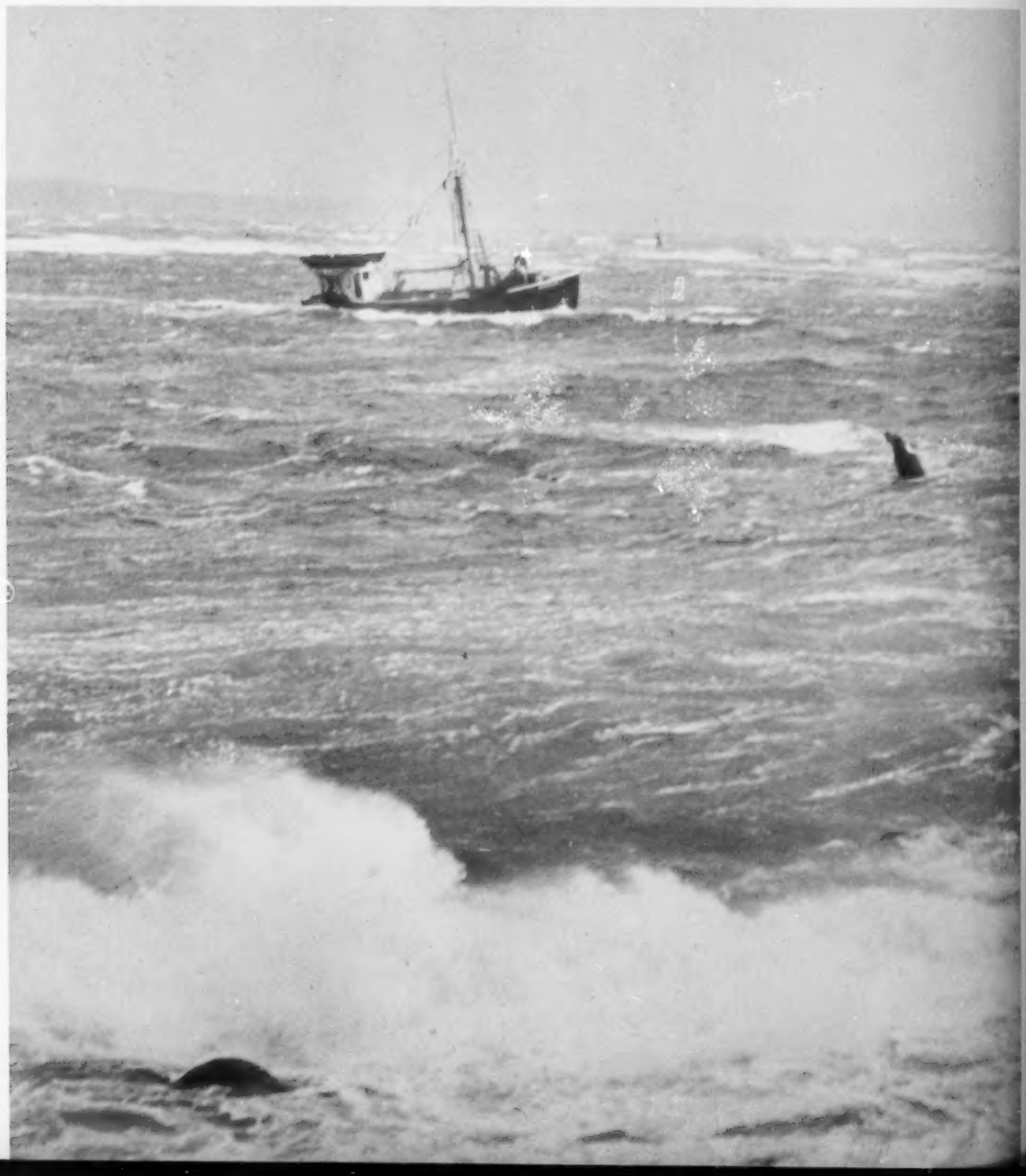
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